MODERN PLASTICS

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JUNE, 1936 VOLUME 13 NUMBER 10

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NEXT MONTH

We are promised a story on furfural resins which is particularly timely since it was discussed recently with considerable zest at the second Dearborn Conference of the Farm Chemurgic Council.

Furfural may be made from leaves, bark, corn stalks and many other waste products and has a number of industrial applications. Its derivatives used in the manufacture of plastics is its third largest use.

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what can you gain by entering the MODERN PLASTICS COMPETITION?

There is no entry fee. And your entry may bring you a substantial cash award. But is that all? Not by a very, very longshot! For whether you win or not, the plastics competition will serve to focus the attention of the whole industrial world upon the achievements of the plastics industry and of yourself or your firm. Hundreds of newspapers and trade publications have already requested photographs of entries, prize winners and run-of-contest, and publicity material of interest to their readers. With the announcement of the awards of the judges—in the October issue of MODERN PLASTICS—thousands will visit the sixty-day exhibition of entries—hundreds of thousands will read about and view pictures of the winners and the displays. Whether you are a designer, a user of plastics, a plastics manufacturer or fabricator—we say, "For your own sake, enter your achievements, Now!" Details about the contest are published below. For entry blanks and further information, write today.

NO ENTRY FEE; NO LIMIT TO NUMBER OF ENTRIES—Any number of plastic parts or designs may be submitted by: Manufacturers making use of the design entered; manufacturers supplying the plastics material from which the designs were created; molder, fabricator or laminator who produced the designed object; machinery or tool manufacturer whose equipment was used in producing the designs; independent or company engineers or designers responsible for the submitted design.

THREE CLASSIFICATIONS; NINE CASH AWARDS—Entries will be assembled under three groups of classifications; industrial, style, decorative. Each classification will have a separate board of judges selected because of their knowledge of that particular field. Judging of entries will take place immediately after the contest closes and the awards will be announced, illustrated and described in the October 1936 issue of MODERN PLASTICS.

Three cash awards will be made in each of the three groups; 1st, $125.00; 2nd, $75.00; 3rd, $50.00. Certificates of award also will be given to the companies sponsoring the winning designs as well as to the molders or fabricators, suppliers of materials, and suppliers of equipment used in their production. Every entry will gain the unprejudiced and expert appraisal of the judges along with valuable publicity and prestige.

MOLDERS, DESIGNERS, ENGINEERS: Look over the products you have turned out since last August, select the best ones and enter them right away. Simply write us for free entry blanks. Act now to avoid the closing rush.

If you are in doubt about any detail, write us.

MODERN PLASTICS
425 FOURTH AVE. NEW YORK CITY

MODERN PLASTICS

BRESKIN AND CHARLTON PUBLISHING CORP.
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JUNE 1936 VOLUME 13 NUMBER 10

Transparent resins in England

BY W. HAMILTON GORDON

TWO new plastic substances recently produced by Imperial Chemical Industries Ltd., London, and marketed by their associate company, Mouldrite, Ltd., have excited considerable interest in Great Britain by reason of the wide industrial possibilities they offer. Really only one material, but in two distinct forms, this transparent resin of the thermoplastic type can be cast in sheet and is then known as "Perspex." It can likewise be produced in the form of very small granules, resembling minute hailstones or tapioca grains, or as a powder, then molded by the usual compression or injection method. In this case it is given the name of "Diakon." In molding by compression, temperatures ranging from 130 to 190 degrees C. are used; where the injection method is employed the temperature range is from 135 to 180 degrees C. Both plastics are as easy to work as a soft metal. They can be turned, milled, cut, bent, bored and polished with the usual machinery and tools employed for metal and glass working.

Perspex is at present being manufactured in large quantities in England but owing to the heavy demand for it by the very busy aircraft industry little or none is available for other uses, and it is not available abroad. It is used for the transparent superstructures enclosing the cockpits of airplanes for protection of the crews against wind and cold at the high speeds and altitudes of which the new types of machine now being turned out for the Royal Air Force are capable. For aircraft construction Perspex offers the advantages of being less than half the weight of glass, of not becoming brittle at low temperature, and of remaining free from discoloration by the ultra-violet light to which airplanes are much exposed in the upper air. In some cases the framework of the hood over the cockpits of airplanes is being made of Perspex as well as the windows, thus doing away with any obstruction to visibility all round.

Diakon is also used on airplanes for inspection covers, instrument boards and wing tip lights—for which applications glass is discredited by its weight and fragility. This material, now available in quantity, is extremely transparent to visible and ultra-violet light. It has a warmer feel than glass, is relatively unbreakable, and weighs less than half as much. It is already enjoying a very wide range of commercial applications although this field has not yet been fully explored by any means. By reason of its transparency, non-fragility and the ease with which it can be molded, it is ideal for panels and inspection cover plates in electrical and other machinery—particularly where lightness is essential—doing away with the need for taking panels off to see what is wrong inside. In the electrical industry it is also suitable for fuse and junction boxes, relay and contractor gear covers, and apparatus where effective insulation is required. Transparent radio cabinets, battery boxes and ac-

Transparent and colored telephone instruments that will withstand the rigorous climate of the tropics are made possible with Diakon, the new British resin

cessories are similarly being made of it quite generally.

Both types of the material are strongly resistant to acids and alkalies and are not affected by kerosene, lubricating oil, or salt water. Beyond these advantages, they are soluble in organic solvents like chloroform acetone, benzene, and toluene, thus allowing pieces to be cemented together with invisible joints. The molding type can also be prepared as a transparent solution, as required, and in this form is likely to find many applications as a lacquer for cloth treatment and similar purposes. The water absorption of these plastic materials is exceedingly low so that there is freedom from shrinkage and distortion, while, together with the advantage of transparency, they possess tensile and bending strengths 100 and 50 per cent greater, respectively, than those of the plastics which most nearly resemble them and are far better known.

For many molded products, transparent or colored, among which are cosmetic boxes, ornaments of various descriptions and fittings, there is an excellent opening for Diakon. It can be produced clear, transparent, or opaque, in every color from milky white to black. Perspex is used in water-white form for spectacle frames, its advantages being that it does not discolor, is very light, non-fragile, and kind to the skin. In one or the other form the material is being used for stethoscopes and various surgical requisites (where the fact that it is not cold to the touch is an asset); transparent, engine-turned notecases; lampstands and clock cases.

One interesting development is the use of the molding compound for fountain pens. The pen has a transparent reservoir so that the quantity of ink available is always visible. This is already finding a big market, retailing at about the equivalent of 12 cents, complete with "platignum" nib. However, there are still

More transparent than glass and in rainbow colors or water-white, Diakon cosmetic boxes add to strictly practical qualities an appeal to the discriminating woman who likes to see what she is buying. Molded in 2 oz. and 4 oz. sizes by Ebonestos Insulators, Ltd.

One of the many novel applications of Diakon. Transparent covers, molded by de-la-Rue in standard compression molds, are in every way as strong and serviceable as the customary material yet display to advantage every detail of the Gestetner Precision inker. Right, Perspex hooding over the cockpit of the new "Battle" bomber produced for the Royal Air Force by the Fairey Aviation Company

a number of other industrial applications for Diakon to come. For example it has not yet been adopted for bedroom and kitchen requirments, but on account of its negligible water absorption and resistance to corrosion by many acids and alkalies there will be many uses in this field that it can be put to.

One of the greatest attractions of these new materials is that they do not distort with climatic changes. Up till now it has been found difficult to produce an entirely efficient material for telephone or other molded instruments intended for use in centrally-heated buildings or for use in dry climates where there are great fluctuations in temperature. Most resins so far developed have been found to warp or crack, but not so with the new materials, which are not affected in this way. As they are entirely transparent in their natural state they can be dyed to any desired color and a very wide use is predicted for them, especially in the tropics. A large order for molded colored telephone instruments for New Zealand is now being executed, and in that country up until now the existing range of plastics has not permitted this type of instrument to be used.

In conclusion, the manufacturers claim that Perspex and Diakon give the best combination of strength, transparency and light weight of any plastic material yet produced.

Inviting sales through redesign

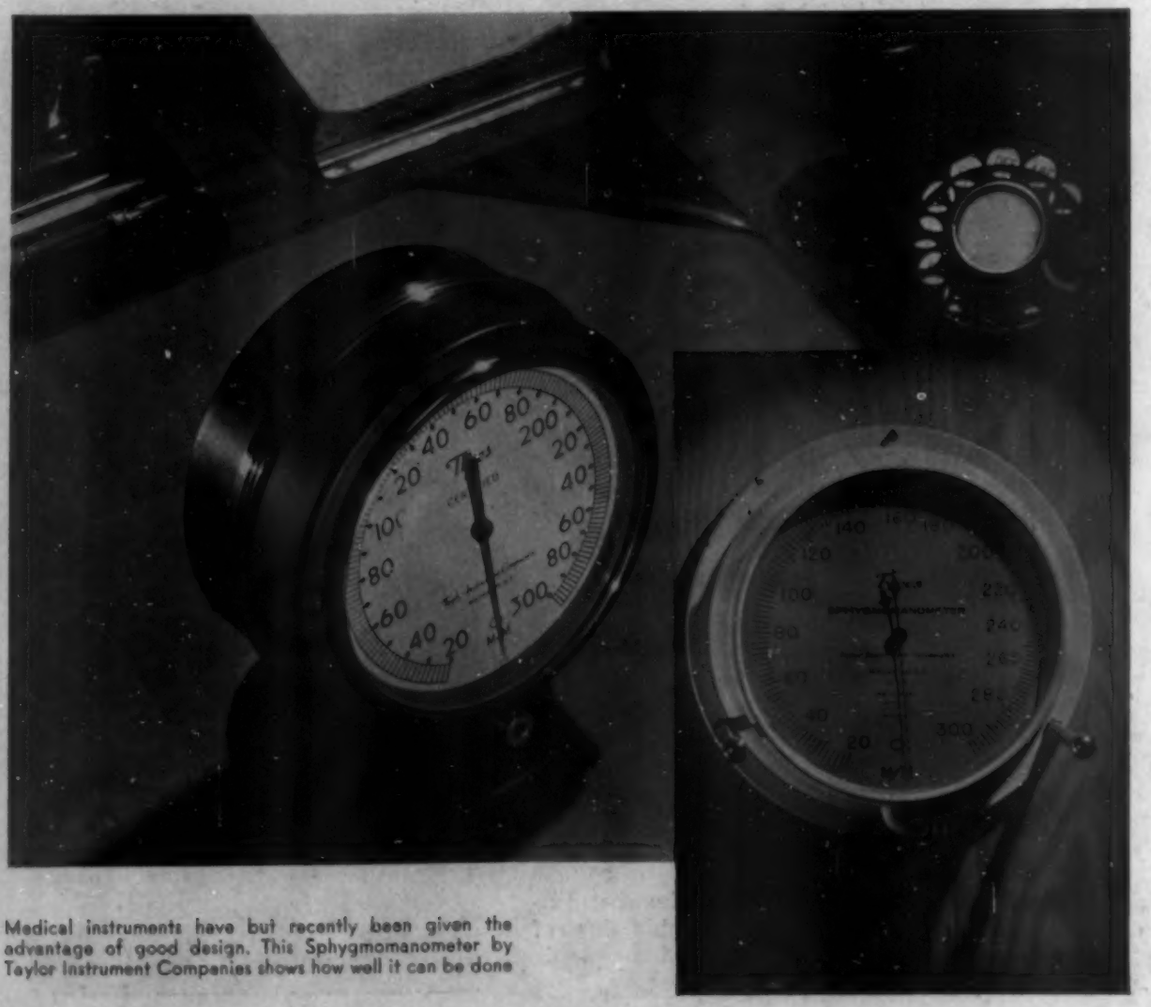
Salvaging molds used for a previous model saved money without any sacrifice in appearance of the final new design

WHEN in 1927, the Taylor Instrument Companies brought out their Stormoguide, they pioneered an improvement which lifted the barometer out of the strictly scientific class and made it an instrument easily used by anyone not familiar, through experience, with interpretation of its indications in terms of weather forecasts. The simplified dial containing direct weather trends more or less overshadowed the design of the housing which took a plain round form.

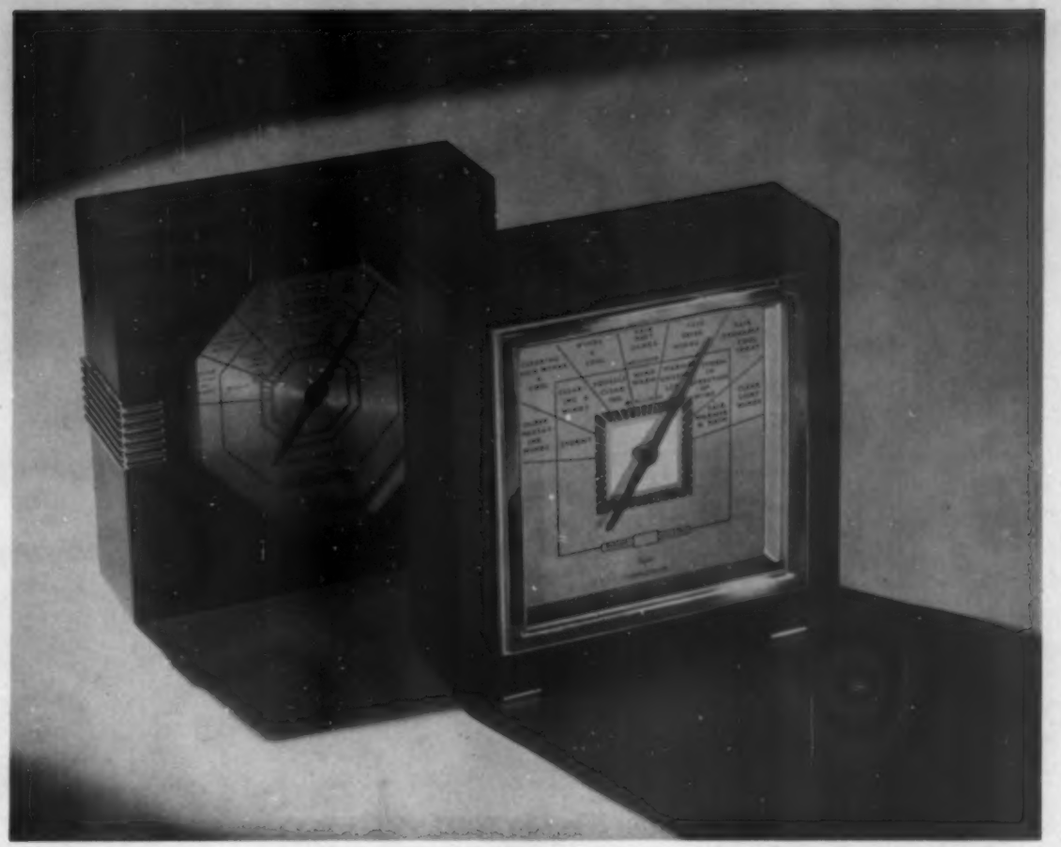
Later, in 1931, the entire instrument was redesigned and housed in a molded phenolic case with the addition of two small chrome plated metal decorative pieces, one at each side of the dial in a horizontal position. As acceptance of this design became apparent after its introduction, it developed that the preponderance of black and the resulting darkening effect on the dial was proving a handicap. The dial was difficult to see, the weather predictions became hard to read, and the choice, by its former designer, of a relatively gray material for the dial further aggravated this phase of the situation.

It was finally decided to give consideration to redesign of the Fairfax Model Stormoguide and H. Brainard Brown, development engineer of the company, whose design is being currently introduced as the new model, decided to salvage the molds used to produce the former. His first step was to enlarge the dial and change its shape from octagon to square. This immediately improved the reading qualities and a further change in the finish to a two-tone silver, and the addition of a chrome bezel around the dial serves to give the entire instrument an appearance of life and sparkle previously lacking.

Salvaging the molds for the case or housing with a resulting design as effective as that produced has



Medical instruments have but recently been given the advantage of good design. This Sphygmomanometer by Taylor Instrument Companies shows how well it can be done



The famous Stormoguide has been redesigned again for easier reading—but molds for the former design were salvaged and are being used for the new model

proven an exceedingly interesting experiment. It gives an instrument capable of performing lifetime service, an appearance and permanent finish that only a plastic can give. The success of this particular development prompts the thought that while circumstances are by no means universal, there are undoubtedly a great many instances where changes in design and general improvements can be made through modification and salvage of molds. Such changes, desirable as they often are, sometimes suffer postponement when new tool costs only are considered.

When complete redesign is thought advisable, mold costs seldom prove a serious handicap to companies whose experience has taught them the advantages to be gained by a more acceptable appearance of the merchandise they manufacture. It has been a comparatively short time since the importance of appearance and design has been recognized in things like medical instruments. Accuracy is naturally acknowledged as the first requirement of any instrument serving such an important function in diagnosis as does an indicator of blood pressure. In the past, practically all such instruments bore a rather sinister appearance. They had a look about them more calculated to arouse a feeling of what such thing would do to one rather than the reaction that "nothing as good looking as that can be too tough to take." In other words, they seemed to promote the wrong psychological aspect at the outset and the factor of appearance worked in a negative way instead of creating confidence.

The Taylor Instrument Companies recently came to the conclusion that they had an instrument of this outmoded character in the former model of their office or desk style Sphygmomanometer (blood pressure tester, in case you don't know) and decided to do something about it. Despite its precision accuracy and perfection of performance, its appearance affected its acceptance—and in turn, its sales. Furthermore, in its general make-up, it lacked stability—it was liable to move and shift about on the physician's desk or consulting-room table. Its light colored finish showed handling and wear too easily.

The use of this particular model of blood pressure instrument required a rubber tube to connect it with the pressure bag on a patient's arm. It, therefore, had to have sufficient weight so that it would not be affected or displaced by motion of the connecting tubing. This need for relative weight formed the first step in consideration of its redesign. The resulting model shown in the illustration, has increased the sale of this instrument more than 300 per cent. and introduces features completely lacking in the former design.

The substantial base molded of phenolic plastic provides a mounting unaffected by antiseptics and other chemicals which are likely to come in contact in use by the medical profession. Its finish is permanent. In addition, the case composed of two metal shells securely held together by means of a bright chromium plated reeded band is finished in a phenolic resin-base material thus providing a (*Continued on page 65*)

PLASTIC MODES

BY EVE MAIN

1 B. ALTMAN

LORD AND TAYLOR

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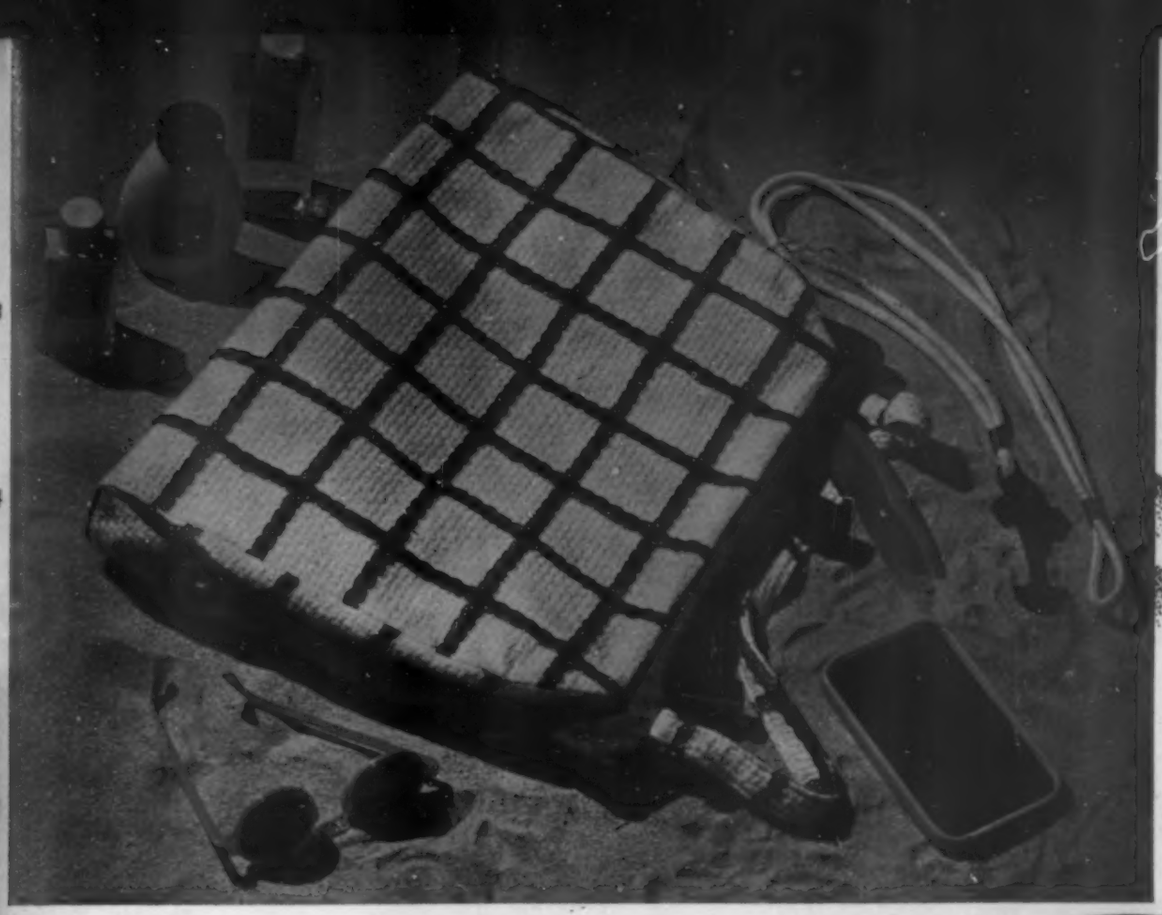


DEAUVILLE SPECIALTIES

Come June and beaches swarm with vacationists soaking in sunshine and sea breezes against working days in the city. Versatile plastics do their bit to make summer accessories colorful and gay as well as practical, for sunshine and salt water have no effect upon them. To mention a few:
1. Petite but serviceable razor and shaving brush with cast resin handles in compact cast resin tube. 2. This young tanner-upper wears a one piece blue woolen swim suit with white belt held in place by four thick blue plastic buttons; a pair of sun glasses with cellulose frames; and a new shade-giving beach hat made entirely of cellulose acetate—ribbon laced, ending in a topping bow and plastic knob at the peak. The rubber lined toweling beach bag has a plastic fastener in the center of its wooden frame.
3. Dorothy Gray's sunburn cream and summer face lotions in neat blue-labeled bottles with molded plastic caps, regulate tan to an even shade. 4. An essential beach bag fitted with plastic comb, and sun glasses and mirror with plastic frames. 5. Rope belt with long plastic fish attached to one end. The other end loops around the tail of the fish to fasten. 6. Piqué hat, that lays flat to press, buttons up the back with vari-colored plastic buttons. 7. Swagger stick inspired by Maggy Rouff has cast resin handle and tip, with roomy vanity bag near the top.

ARNOLD CONSTABLE

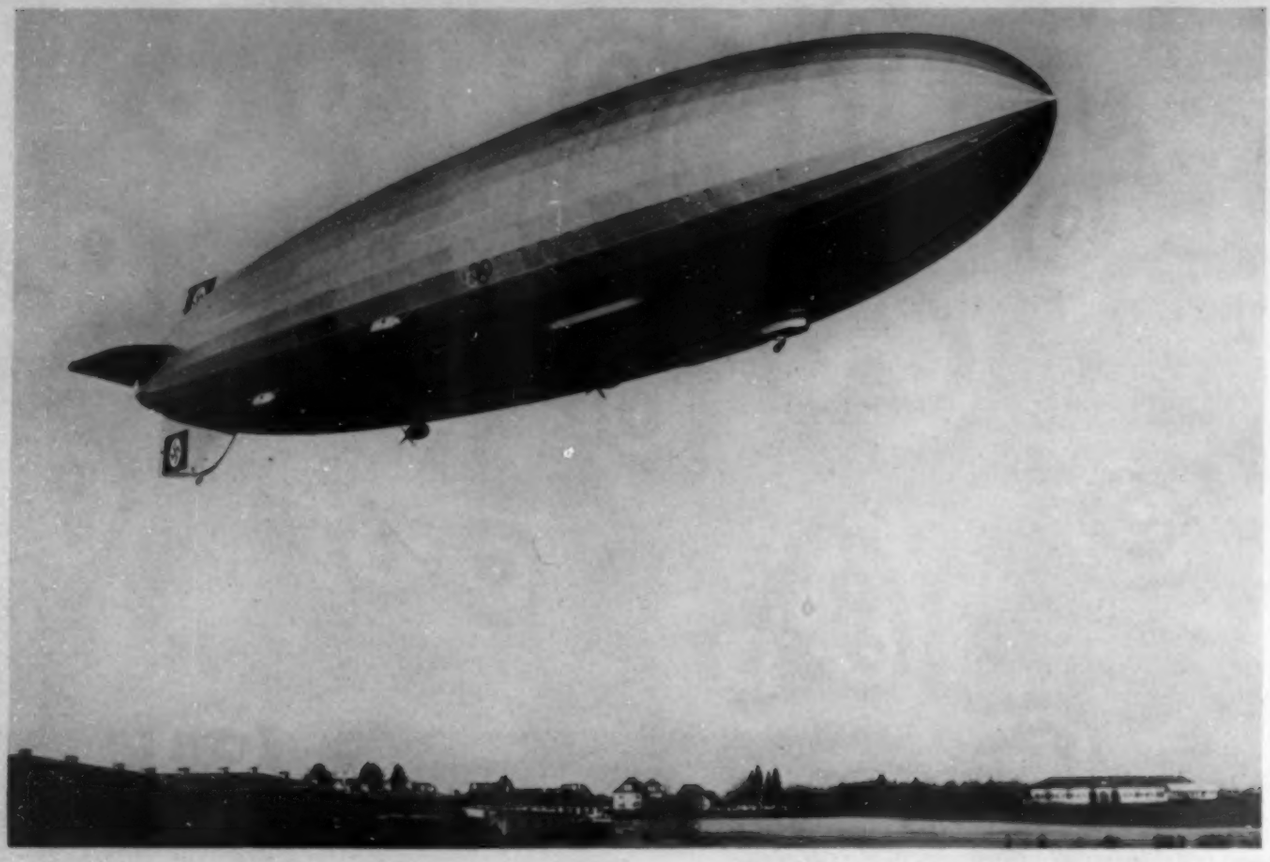
Strenuous sports for keeping in trim bring out the best in plastics. A speedy game of tennis calls for a sturdy racquet and this one has shoulders and throat of white laminated cellulose for additional strength and resiliency—good to look at, too. Breaking 80 on a golf course is a worthy ambition and here's a driver that will help (perhaps). It has a cellulose sheath shrunk on to fit perfectly, preventing rust and insuring continued flexibility. These clusters of colorful tees may be broken apart and used as needed.

A. G. SPALDING

After the game—any game—a picnic is the thing in some shady, secluded spot, with dishes and equipment that can take it and like it. Plates, cups, saucers, drinking mugs, food containers and covers of Thermos bottles in this set are of green urea and the handles of knives and forks are green cast resin to match. For the fishing enthusiast, a husky reel with molded plastic ends, plenty strong enough to haul in the "big one" that didn't get away. And it can never rust.

Information concerning merchandise or materials featured in these pages may be obtained by those in the trade by writing to the Plastic Modes Editor.

ABERCROMBIE & FITCH



The "Hindenburg"

THESE not too clear photographs of the Hindenburg are interesting nevertheless, because they illustrate the choice of transparent resinous plastic by the zeppelin's designers in place of glass for windows of the ship. This modern resinous material gives equal visibility and even greater light transmission besides being more flexible and considerably lighter in weight. It has the ability to "give" in high winds, and is not likely to fracture under any normal circumstances or in rough landings should they occur. The most prominent use of the material appears in illustrations numbered 1 and 5, where observation by passengers of earth and sea scudding rapidly beneath them adds to the thrill and enjoyment of this means of transportation: and in number 6, which shows a close view of the control car where visibility and protection from weather are imperative at all times because the rudder stand, elevator stand, instruments, central telephone station, and navigating equipment are all located here.

Interior arrangements of both passenger and service quarters demonstrate remarkable ingenuity in economy of space without sacrifice of comfort or convenience. The passenger quarters, designed to

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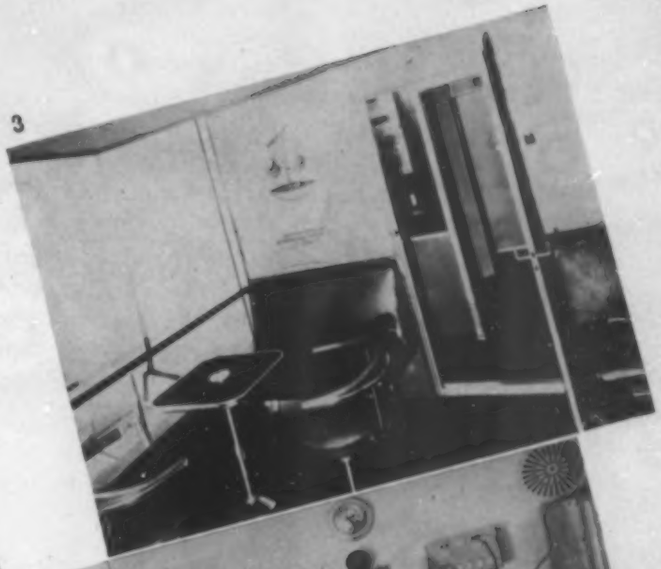
accommodate fifty passengers, are confined to one bay and constructed on two levels just above the control car. Although located completely within the ship's hull, ample visibility is provided by resinous windows along the promenades (about 92 feet) on both sides of the quarters. These windows are built in at such an angle as to provide the widest possible range of vision, both up and down, and are provided on both upper and lower decks.

1. Interior of the passenger lounge with its light weight furniture in the modern mode. The angle of the windows may be seen plainly in this view. 2. This flying galley is the culinary center of the world's largest zeppelin. From this kitchen, equipped with electrical range and duralumin ware, fifty passengers can be fed on each voyage. 3. Here is a corner of the smoking room and flying bar, the door of which is controlled by a push button under the watchful eye of the steward so that no lighted cigars or cigarettes may be carried through the ship. 4. Radio room in which plastics are well represented in conventional service. 5. Dining room, approximately 46 ft. by 16 ft., decorated with paintings of geographical scenes. Windows extend from one end of the dining room to the other, providing both light and visibility as on the promenade deck. 6. Near view of the control car of the Hindenburg photographed upon landing at Frankfort-on-Main.



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Editorial comment

ON JUNE fifteenth our Permanent Plastics Exhibition will be opened at 425 Fourth Avenue, New York City. Specially built cases line the walls and will contain recent examples of the molder's art as well as laminations and fabrications of the various materials. One section will be devoted entirely to plastic products available from stock molds. This will interest a broad range of manufacturers because it will contain a great number of knobs and handles and other parts suitable for many purposes. Radio and control knobs will appear in a variety of sizes and in many colors. It must be remembered that since these parts are molded from molds which already exist, no initial investment is required for mold costs and the items displayed may be obtained in almost any color and in exceedingly small quantities at reasonable prices.

Another item in which there is marked interest, is handles. Hundreds of them will be on display representing a variety of materials, sizes and shapes sufficient to interest manufacturers and designers of almost any line of merchandise or equipment requiring handles of any sort. Boxes, trays, dishes, knitting needles, clock cases, sand molds, vases, jardinieres and other items in an exceptionally wide range of choice will be included in the display.

There will be an exhibit of recent moldings from England and Germany as well as examples of the new transparent resins being manufactured in this country and used in place of glass in the manufacture of aircraft and for similar applications. The exhibition room will be open daily from 9.30 a.m. until 4.30 p.m. and you are cordially invited to drop in at your convenience and browse around.

PERHAPS our greatest gesture of friendly service to manufacturers and designing engineers who are considering the use of plastic materials for any purpose is to help them obtain dependable information regarding the basic properties and physical characteristics of the various materials. To set them straight in their choice of materials for the particular problem they have in mind. To give them sound advice about the best methods to employ in the manufacture of the specific parts they are undertaking. And to put them in touch with the right material suppliers and molders or fabricators from whom they can obtain the greatest satisfaction and the most successful results.

One wrong choice of material or one expensive error in mold design is the most discouraging thing that can happen to a manufacturer who is using plastics for the first time. His unfamiliarity with properties of the different materials, his lack of acquaintance with methods of manufacture and fabrication, are more than likely to influence his judgment when the matter of price is discussed. It has been our job ever since we took over the publication of this magazine to try to keep manufacturers and designers informed on the internal progress of the industry. To show them how others are using plastic materials and to point out the opportunities existent in their own fields. They have come to lean on us more and more until today we find ourselves in the position of national consultants to industry in general.

With an industry making such rapid strides in developing its materials and methods, this is no easy job. Our reader correspondence has increased from a few letters a week (one year ago) to more than a thousand a month. Inquiries in the beginning were comparatively simple and easy to answer. Today, they are complex and more technical in their tone. To answer them intelligently and sincerely requires constant research and investigation. There is ample evidence of the seriousness with which engineers and designers are attempting to translate their new developments and ideas in terms of plastics. Their thirst for information in new materials and formulas is increasingly difficult to satisfy. With this in mind, we launch with this issue a monthly Technical Section which when it gets under way will be able to render immeasurable service to our readers.

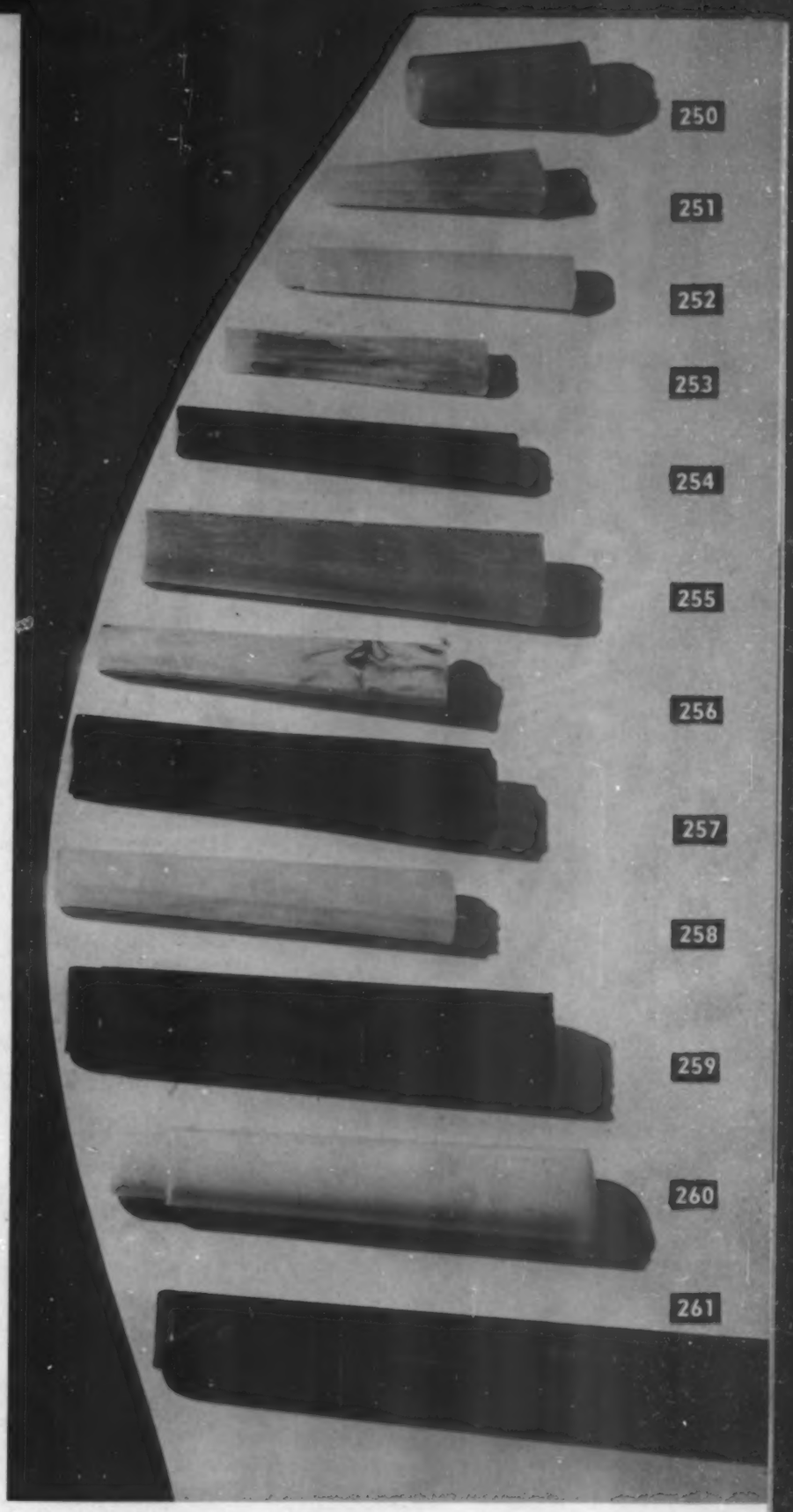
TO FIND a man with the necessary experience and background to handle this section was not an easy job either. He had to be a man in close touch with national developments—yes, even international developments. He had to have at his fingers' ends the equipment necessary to make constant tests and be able to intelligently interpret the results of such tests. He required access to a library of unlimited factual data and information. But more important, he must be a man in a neutral position with no entangling affiliations within the trade which might influence his help and advice. Finally, he must be a national authority.

We are indeed fortunate to be able to announce Dr. Gordon M. Kline, Chief of the Organic Plastics Section of the National Bureau of Standards, Washington, D. C., as Associate Technical Editor of MODERN PLASTICS, beginning with this issue. And we want to publicly express our thanks and appreciation on behalf of our nine thousand readers to Dr. Lyman J. Briggs, Director of the Bureau, for his sanction of this association.

Stock handles of cast resin

SHEET THIRTEEN

PLEASE understand that these cast phenolic resin handles are stock parts but they are *not molded.* Any of them may be had in a choice of bright colors and may be purchased in small or large quantities with economy. They are available "in the rough" for those with fabricating equipment or may be ordered finished and buffed ready for assembling. They make suitable handles for knives, forks, kitchen utensils, stoves, brushes, toiletware, and many other household items. Be sure to mention sheet number and handle number when writing for samples or information.



250. 2 in. long; round at top sloping to oval base 3/4 in. thick and 1 in. wide

251. 1 3/8 in. long with paneled center; tapers from 3/8 in. diameter top to a rectangular base 1/2 in. thick and 3/4 in. wide

252. 2 3/4 in. long plus 5/16 in. groove for inserting into knife cap; 3/8 in. diameter oval top, tapers to base 5/8 in. wide and 7/16 in. thick at base

253. Center panel design; 2 3/4 in. long; maintains 5/16 in. thickness at top and bottom; width tapers from 7/16 to 5/8 inches

254. 3 1/2 in. long; top and bottom thickness 5/16 in., oval design tapers from 9/16 in. to 11/16 inches

255. Beveled sides of this handle permit wide center panel; 4 in. long; 1/2 in. thick across top, 5/8 in. across bottom; width tapers from 3/4 in. to 1 inch

256. Handle with beveled sides; 4 1/4 in. long plus 5/16 in. groove for inserting; bottom 9/16 in. thick, top 8/16 in. thick; tapers from 3/4 in. to 1 in. in width

257. Diamond-shaped handle with beveled sides; width and thickness at top 3/8 in., 5/8 in. thick at base, 7/8 in. wide

258. Plain oval-shaped handle 5/16 in. thick at top, 3/8 in. at base; 1/2 in. wide at top, 1/2 in. wide at base; 3 1/2 in. long

259. Black handle with center panel; tapers from 3/4 in. to 1 in. in width; maintains 1/2 in. thickness throughout; 4 in. long

260. Oval-shaped, 3 13/16 in. long plus 1/2 in. groove for inserting, 1/2 in. thick at bottom, 5/16 in. thick at top; tapers from 5/8 in. to 1 in. in width.

261. Beveled sides and top sloped for inserting or attaching; 1/2 in. thick and 7/8 in. wide at base; 5 1/2 in. long, tapering slightly.

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.

Stock molds

SHEET FOURTEEN

HERE are four different sizes of well designed jardinieres and a tall vase available to retailers and florists without mold costs. Swell premium items, too! They are made of moisture-proof plastics in a variety of good colors ranging from dark brown through red and green to white. Samples will be gladly sent to interested executives but will be billed at a minimum rate to cover shipping costs.

235. Diameter 10 1/8 in. across top, overall height 9 5/8 in., raised decoration

236. Diameter 6 1/2 in. across top, overall height 5 3/4 in., fluted base

237. Diameter 8 3/4 in., overall height 8 9/16 inches

238. Diameter 7 3/4 in., overall height 7 1/2 inches

130. Diameter across top 5 3/4 in., overall height 11 3/4 inches. Decorated base and sides

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.

Neons become flexible

BY FRANKLIN E. BRILL

GENERAL PLASTICS, INC.

WHEN one thinks of neon tube signs, one thinks of vivid, flashing letters piercing the darkness. Few of us stop to consider the problem of changing the message formed by those continuous glass tube letters: actually it's cheaper to start with new tubing than to try to re-bend a figure "2" into a figure "3," or to make an "S" out of an "A." It is this problem, however, that has limited neon signs to advertising uses where changes are seldom required during the life of the tubing. Theatre box offices, directional signs, exhibition booths and retail stores have had to be content with less vivid electric signs because of their need for frequent change.

Now comes Neosign, a new versatile combination of all the brilliance of the neon tube sign with a simple easy method of changing messages as often as required. It consists of a solid screen of some twenty-odd neon tubes, transparent sheets on which letters can be blanked out with opaque paints, and a molded phenolic housing over sixteen in. long. Changing sign blanks is but a matter of seconds. The screen of neon tubes is set into the rear of the molded frame behind a sheet of clear glass. Against this glass are placed transparent cellulose sheets on which the lettering is done in reverse. A hinged front window, instantly removable, holds the cellulose sheet flat against the rear glass, permitting the full brilliance of the neon light to flash through the openings of the letters within the sign.

The rear housing is also entirely molded of phenolic plastics, protecting the working parts and eliminating both the danger of shock and the possibility of rusting or short-circuiting when exposed to wet weather. Either hangers or rubber feet are supplied, and are assembled integrally with the molding. All holes, recesses, mounting lugs, switch plates, carrying handle and the permanent finish are completed in one fairly simple molding operation. (*Continued on page 66*)

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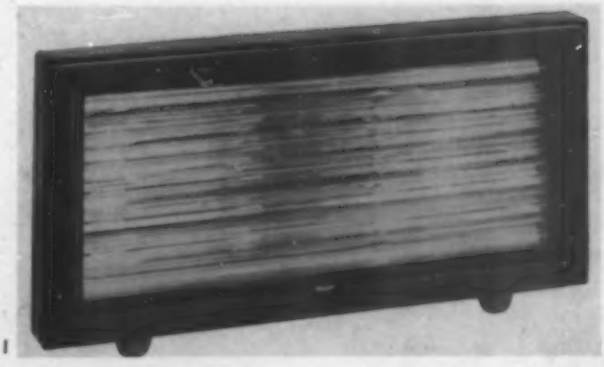

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This neon screen (1) in a molded phenolic frame and housing (2) make changeable neon signs (3) possible with no loss of brilliancy or efficiency of this type of lighting

PLASTICS' PROGRESS

2

1. This twin spoon and fork set will dress up a Sunday buffet supper and make the usually difficult task of serving salad a pleasure. The bowl and tines are of polished chromium and the handles, which are long and easy to manipulate, may be had in either blue or ivory Catalin. Designed and manufactured by Chase Brass & Copper Company.

2. Here is a berry bowl and spoon which can give constant service during these warm summer months. It claims the unusually attractive virtue of being non-tarnishable since the bowl proper is polished chromium, and the base may be either blue or ivory Catalin with spoon to match. Designed and manufactured by Chase Brass & Copper Company.

3

3. A new electric fuse with six lives, which takes the place of a half dozen ordinary fuses, has just been announced by the Indicator Corporation. Whenever an overload melts the fuse, a red neon light glows in the recess at the top calling attention to the faulty unit. A twist of the revolving upper portion places a new fuse in position. Cap molded of Durez.

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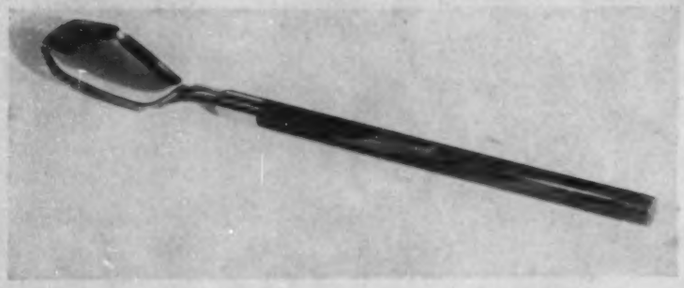

4. The General Electric hot-point mixer comes completely equipped with all standard attachments, including large and small bowls guaranteed against heat breakage. The Texolite handle permits the mixer to be carried and it may be removed from its base and used at the stove or sink as desired. A three-speed switch is located close to the handle, permitting operation without removing the hand.

5. Colored glass diffusing lens screwed tightly over this new-type reflector-socket adds to the effectiveness of outdoor sign lighting. The reflector-socket provides greater light, lower power consumption and less loss of brilliance than occur with dirt-collecting painted bulbs.

The reflector is molded integrally with the Durez body and is self-insulating, heat-resistant and weather-proof. Developed by Climax Lamp Inc.

6. For those who like the smell of fresh pine in the home, this air-conditioning device is ideal. A brown Durez case completely encloses the small, powerful, motor-driven fan which draws air in through the back, passes it through a filter pad moistened with the essence of pine, and re-circulates it throughout the room. The grille is chromium-plated. Molded by Imperial Molded Products Company.

7. Normandie Perfumes come from France bottled and packaged with customary Parisian chic. Purse-size vials have molded tops and slip into molded protective capsule cases with novel screw-on caps. Many pastel shades are available at a surprisingly low retail price. The perfume is excellent, too.

8. The Fiberloid back of this "Lucky Turtle" hand and nail brush fits perfectly into the hand, and the resilient bristles are compactly sealed-in so they will cleanse without spattering. The pointed tail serves as a nail cleanser. Obtainable in five colors from the Pro-phy-lac-tic Brush Company.

9. Trim and smart, this tall, graceful salt-cellar adds life to kitchen accessories. Its shell is of red Plaskon but may be obtained in various colors. The top and screw-on base are chromium. Molded by Imperial Molded Products Company.

10. A little delayed perhaps in Plastics' Progress but nevertheless appropriate, is this unique Easter display for Elizabeth Arden by Jenter Exhibits. Mr. Jenter reproduced an Easter lily even to its most intricate detail in du Pont Plastacele. Many of the small boutonnieres so popular this season are made of Plastacele and like materials.

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FOR HAMILTON: ANOTHER.

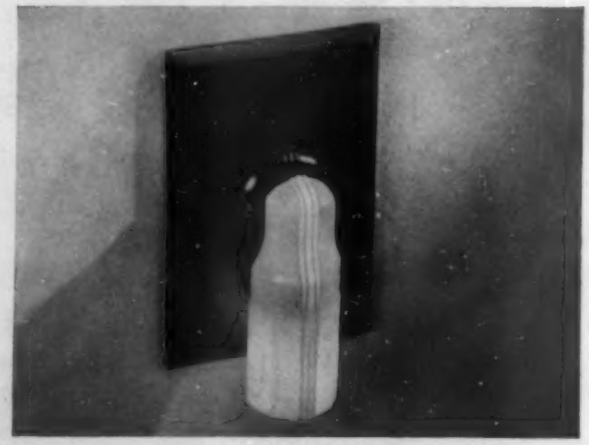
Plaskon is glad to announce that the Hamilton Watch Company has added another Molded Color watch case to its package line. Six months ago—shattering the long standing custom of using cloth covered boxes—the Company introduced a two-tone ivory Plaskon case. Its advantages were its light weight, its light- and sun-fast color and its added eye interest. Its unknown quantity was the kind of reception Hamilton's dealer clientele would give a plastic case.

As you'd suspect from the encore, the novel package scored a direct hit. The present case is the result of dealer enthusiasm and a sales increase, attributed largely by Hamilton to the Plaskon case. With this in mind, it might very well be worth your while to check on your container . . . and on Molded Color—the material choice for successful packages. It may be molded in any size container your needs may determine—in the color or colors most effective for the presentation of your product.

Responsible for this fine molding job which is a replica (except in size) of the first molded watch casket: Plastics Division of Armstrong Cork Products, Lancaster, Pennsylvania.

FOR NIGHT LIGHT:

Providing a soft, economical all-night light for sick-room, stairway or hall is the laudable mission accomplished by the Glo-Nite Light—a product of Monowatt Electric Corporation. The light is switched on and off by turning the whole fixture in one's hand—an innovation made possible by the exclusive Monowatt rotary switch control. Installation of



the unit is very simple—the light is connected by merely plugging into a wall socket. Plaskon entered the picture when need arose for a durable, light-diffusing plastic of which to make the light shade. That it remained there is something you've already guessed. The Glo-Nite Light was molded by Monowatt Electric Corporation, Bridgeport, Connecticut.

ELECTRIC MIXER:

From Ohio, and specifically from the Alliance Manufacturing Company, comes an electric mixer that changes cream to whipped cream in seventy seconds, and stirs a drink as professionally as your favorite shaker-upper.

Plaskon is used for the housing of its noiseless motor to provide adequate protection for the mechanism, and to keep unit weight at a minimum.

Quite naturally—what with the vogue for colorful appliances to complement kitchen decoration—Alliance chose to supply the mixer in three pastels.

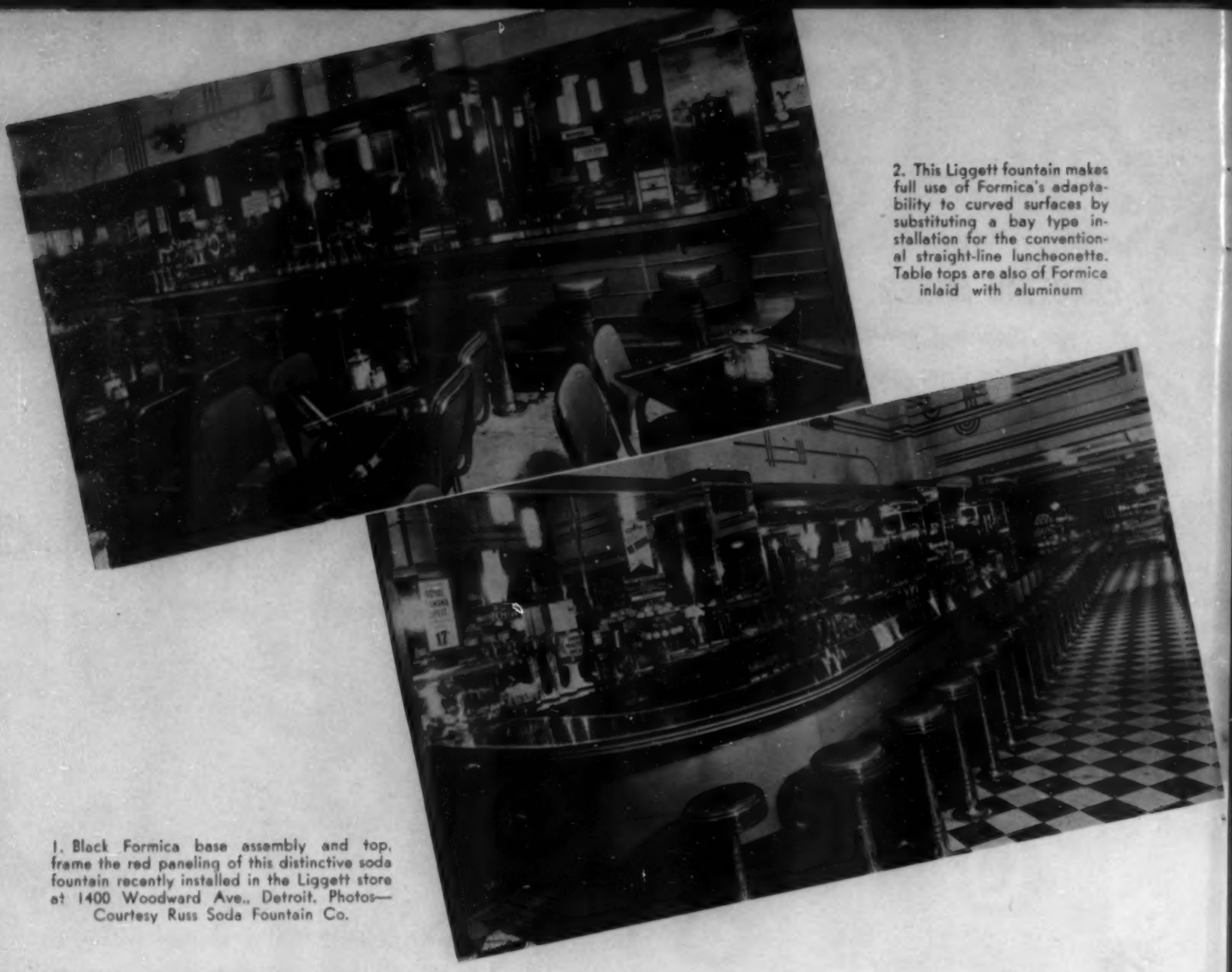
From Plaskon's infinite color range, it could have been furnished in any shade or tint that diligent kitchen-schemers could think up. Like every Plaskon molding, each unit is resistant to an organic solvent such as alcohol, and to citrus fruit juices. And because Molded Color is permanent, easily cleaned color, each will always be as bright as on the day it became the housewife's private property. The housings are molded in red, green, yellow by General Industries Company, of Elyria, Ohio.

CAPS:

No woman is likely to sit down and think . . . about the ideal closure on her tube of sunburn cream. But if she did she'd like a grooved edge to keep it from slipping out of the hands; an even threading to make sealing and re-sealing unconscious actions: and she'd like a closure that didn't break when screwed tightly, or dropped.

The caps for X-Bazin Cream and for the Quinlan Sunburn Cream, molded of ivory Plaskon, preclude a satisfied customer. Plaskon's uniformity of strength and beauty of color assure the manufacturer that his package is performing perfectly under constant daily use. Molded by General Molding Company of Philadelphia.

MOLDED COLOR
PLASKON



2. This Liggett fountain makes full use of Formica's adaptability to curved surfaces by substituting a bay type installation for the conventional straight-line luncheonette. Table tops are also of Formica inlaid with aluminum

1. Black Formica base assembly and top, frame the red paneling of this distinctive soda fountain recently installed in the Liggett store at 1400 Woodward Ave., Detroit. Photos—Courtesy Russ Soda Fountain Co.

Clean, decorative and inviting

BY AL HAYWARD

KEEPING in step with decorative trends, soda-luncheonette counters are breaking away from conventional rather drab exteriors and are taking on a sophisticated air that rivals the most modern bars in the swankiest night clubs. One good reason for this is that drug store luncheonettes in sizable cities have become definitely established as accepted lunching places for business men and women who usually want to eat and run. Since this business is highly competitive its success in any store depends almost as much upon a clean sanitary appearance as it does upon the food served. Customers are often first attracted to a place largely because of an inviting atmosphere and then, if they find the food good, they form a habit of eating there.

Being fully aware of this situation the Russ Soda Fountain Co. recently completed a series of new counter designs using Formica, a laminated plastic, for modern effect, which represents their first real experience with plastic material for soda fountain exteriors. A few outstanding installations in various sections of the country have already been made, all of which have proved most satisfactory.

The use of laminated comes to the soda fountain industry backed by years of successful adaptation to the food and drink service field. Its use as a superior material for table and cabinet tops, store fronts and wall paneling is recognized wherever a clean, sanitary and permanent finish is essential. It combines durability with appearance to bring a distinctive note of modern attractiveness to the soda-luncheonette exterior. Hot dishes or spilled liquids have not the slightest effect on its smooth lustrous surface. This feature alone gives it a (*Continued on page 60*)

Technical Section

MODERN PLASTICS

EVERY SIDE of the PLASTICS PICTURE

Like the industry it serves, Modern Plastics is given to rapid changes to meet rapidly changing conditions. Let a new trend begin to cast its shadow before it, and Modern Plastics will be on the spot—reporting, photographing, analyzing and preparing the industry and its clients-in-all-industry for the changes to come. ¶ Typical example is this new Technical Section of Modern Plastics. ¶ Not that technical development is new . . . . the entire plastics industry is a triumph of applied chemical and engineering technique. But rather that a new phase of technical development is obviously at hand, following a period of assimilation of previous achievements. New plastics, new products, new processes are coming from the laboratories in a growing stream. ¶ Let them come, we say! Under the able technical guidance of Dr. Gordon M. Kline of the National Bureau of Standards, they will be reported—as they occur and interpreted in all their implications, every month in the new—

TECHNICAL SECTION OF

MODERN PLASTICS

425 FOURTH AVENUE,

NEW YORK CITY

Introducing our associate technical editor

DR. GORDON M. KLINE

Dr. Kline will welcome queries from readers on any technical or scientific subjects dealing with plastics in any form. All letters should be addressed to him, c/o Modern Plastics, 425 Fourth Avenue, New York City. Questions and replies will be printed (names omitted) the following month. If a more prompt reply is desired, a self-addressed stamped envelope should be enclosed.

DR. GORDON M. KLINE, chief of the Organic Plastics division of the Bureau of Standards, Washington, D. C., has consented to take on the additional task of acting in the capacity of Associate Technical Editor of MODERN PLASTICS beginning with this issue. His advisory work with this magazine so closely parallels developments within the Bureau that each will be mutually beneficial to the other and his appointment has been confirmed and approved by Dr. Lyman J. Briggs, Director, whose letters appear elsewhere on this page.

Dr. Kline brings to our readers a wealth of information and experience in the technical development and handling of plastic materials and offers a source of unbiased opinion and information in response to reader queries not available elsewhere. His position quite apart from the industry yet closely associated with it through experiments constantly taking place at the Bureau, gives him an exceedingly broad view of the entire plastics field, its opportunities and potentialities, which is of infinite value to those of our readers with technical problems on which they would like help and advice.

Dr. Kline is a graduate of Colgate University, 1925, and received his M. S. degree at George Washington University in 1926; he received his Ph.D. degree at the University of Maryland in 1934, (completing the course after working hours); majored in organic chemistry, with a physical chemistry minor. His doctor's dissertation was on the subject of the polymerization of olefins which is of theoretical interest not only in the production of resins from unsaturated petroleum constituents, but also in the resinogenic reactions of compounds containing ethylenic bonds, such as vinyl chloride and styrene.

Prior to his connection with the Bureau, Dr. Kline worked at Picatinny Arsenal conducting research investigations on the production and purification of organic compounds for high explosives and cellulose nitrate for smokeless powder. He joined the staff of the National Bureau of Standards in 1929, and since 1930 has been engaged on problems dealing with uses of synthetic resins and cellulose esters.

When the Organic Plastics Section of the Bureau was organized in October 1935, Dr. Kline was appointed its Chief and has contributed articles to National Bureau of Standards Journal of Research, Industrial and Engineering Chemistry, Journal of the American Chemical Society, Scientific Monthly, American Dyestuff Reporter, Aero Digest, and Modern Plastics. He is a member of the American Chemical Society, Phi Beta Kappa, and Sigma Xi.

Editorial contributions by Dr. Kline will appear monthly and all technical articles included in these pages will have the benefit of his blue pencil before they reach our readers in type. By going more deeply into the chemical nature of plastics we plan to give our readers a better understanding of the practical uses to which they are suited.

Editor, MODERN PLASTICS:

Referring to your letter of April 16, we are pleased to have our Dr. Gordon M. Kline serve as Associate Technical Editor of your journal.

Respectfully,

Lyman J. Briggs, Director

U. S. Dept. of Commerce
National Bureau of Standards
Washington, D. C.
April 24, 1936

Plastics and the tin can industry*

BY GORDON M. KLINE
NATIONAL BUREAU OF STANDARDS

EVERYONE is aware of the whirlwind conquest which plastics have made in the matter of closures for glass containers. Few realize the headaches which this irrepressible industry is now causing the manufacturers of tin cans and, in fact, of food containers of all sorts. The producer of glass containers who is willing to disregard developments in the synthetic transparent materials has not profited by the experience of his associates in the automobile glazing business. Likewise the fabricators of fiber containers should be on the alert for new resins which will impart improved properties to their products. However, it is the tin can, that lowly subject of witticisms involving brides, broken can openers, and dinners out, which is most immediately concerned with the continuous output of new resinous materials by research chemists. The entrance of these tin containers into the retail distribution of beer in place of glass bottles has been made possible by the use of chemically stable plastics to line them. Today wax compositions and vinyl resins are employed for this purpose, but it is unlikely that these materials will continue to monopolize this field.

Plastics, however, have a far greater potential application to the canning industry in this country than as linings of the common tin-plated containers. Some pertinent facts on this relationship are submerged in a 1111-page report (1935) of the subcommittee of the House Committee on Foreign Affairs, which investigated the extent to which the United States is dependent upon foreign nations for its supply of tin. Evidence submitted to and data collected by the committee indicated that tin is an outstanding example of those materials essential to industry and the national defense, in which our national resources are either deficient or insufficiently developed.

The Malay States, Bolivia, Netherlands, East Indies, Siam and China are the leading world producers of

* Publication Approved by the Director of the National Bureau of Standards of the U. S. Department of Commerce.

Are these the fore-runners of plastic food containers?

Or will plastics' future role in food packaging be as linings for this type of container?

tin. During the course of the Congressional investigation, Mr. W. H. Phelps, President of the American Can Company, was asked whether his firm was faced with a serious situation regarding the ability to secure tin during the Great War. He replied, "Yes. We had to substitute very largely, wherever we could with dry products; we had to substitute paper cans and cans made with pasteboard."

A leaflet entitled "Substitutes for Tin Cans," issued during this period (1917) by the Bureau of Foreign and Domestic Commerce in collaboration with the National Bureau of Standards discusses the steps which were taken to conserve the supply of tin in this country. Modern plastics show promise as suitable substitutes for tin and other "strategic" materials in such emergencies, which may explain why the synthetic chemicals and plastics industries are so diligently nurtured by the various governments in Europe.

The National Bureau of Standards at the request of the War Department made a brief study in 1931 of the problem of finding a substitute for the tin food container. One of the most promising substitutes for the present container is a can prepared from the steel base plate used at present, but protected from corrosion by a coating of resin or varnish instead of plating it with tin. Among the materials which were investigated for this purpose were glyceryl phthalate, phenol-formaldehyde, petroleum and vinyl resins, cellulose nitrate lacquers, a synthetic drying oil, varnishes made with a nondrying oil obtained from the shell of the cashew nut, and the usual varnishes employed in the food-processing industries. These were subjected to various laboratory tests, including determinations of flexibility, chemical stability, and resistance to weak acid and salt solutions. Fiber containers with and without impregnation with resins, and some molded containers were also studied. The results of this investigation were submitted to the War Department in confidential reports. The following excerpts from the testimony published in the House committee report indicate the conclusions that were reached.

MR. CALDWELL (Congressman from Florida). On the matter of tin and tin (*Continued on page 67*)

Challenge to old materials

BY E. L. PATTON

ADVERTISING MANAGER PITTSBURGH PLATE GLASS CO.

Is this the beginning of the end of certain plastics or will their sponsors answer this challenge with improved materials of even greater advantage?

IN 1905, the world was just beginning to emerge from the horse and buggy era. Automobiles were decidedly in the minority—contraptions that brought forth caustic remarks as they puttered down the street. It was in that year Englishman John Crewe Woods discovered that if a glass sandwich was made with a sheet of glass on each side of a sheet of transparent cellulose nitrate and affixed by a transparent cement, then that interior sheet would tend to prevent the glass from scattering when it was struck.

An excellent discovery to be sure, but, after all, to what purpose could such a glass be put? In homes? Highly impractical when one considers the infrequency of window breaking likely to be injurious. For glazing commercial windows as a protection against thieves? Possibly, but this glass could be procured only in sizes smaller than the average window; then, too, the additional cost would be prohibitive. In automobiles? Decidedly not! Most automobiles had just a windshield, and besides, the horseless carriages would never replace the horse and buggy.

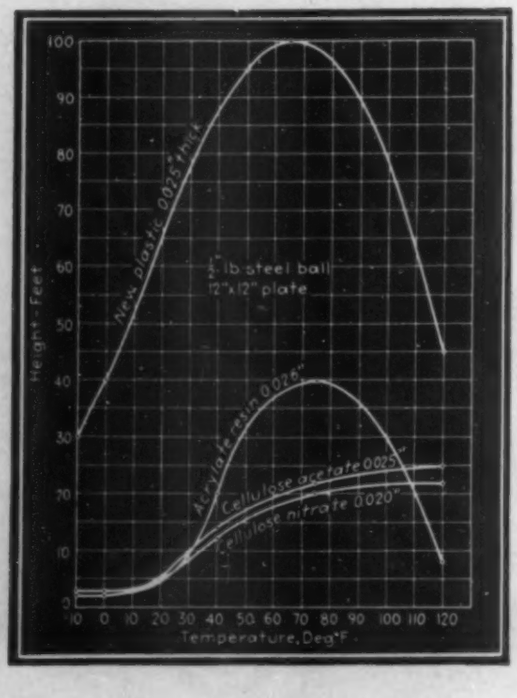
Just as the automobile industry was starting to boom and open up a possible market for this laminated glass, the World War broke wide open. All further development was cast aside and it was not until 1927 that this country saw safety glass put to its first extensive commercial use in the quickly revived automobile industry.

Although there have been many attempts to develop plastics of a different character, it is interesting to note that the cellulose nitrate plastic originally tried by Woods is still used in approximately 30 per cent. of all safety glasses, and only two others have reached commercial proportions. They are cellulose acetate, accounting for about 70 per cent. of the total and acrylate plastic about 0.5 per cent. Now, however, an entirely different type of plastic has been developed and is being placed on the market. The deficiencies present in the cellulosic plastics, such as loss of strength at low temperatures, absorption of moisture and resulting separation around the edge, lack of elasticity, and difficulty in cutting the safety glass and requisite edge grooving and sealing operations will be entirely eliminated.

There being a well established market for safety glass in the United States calling for approximately 10,000,000 lbs. of plastic a year, naturally all producers of resins and large research departments working in the field of resins were extremely anxious to develop a plastic of superior qualities. A great many materials and modifications of them were tried out, but the requirements of the perfect plastic for safety glass were so high and so difficult to achieve that most of the suggested materials were discarded at once. However, many appeared promising. Resins such as vinyl acetate, vinyl chloride acetate, methyl acrylate, an urea formaldehyde, mixtures of cellulose derivatives and resins, and various esters and ethers of cellulose such as cellulose propionate, benzylcellulose, and ethylcellulose, all seemed worthy of further development. Many of these materials were followed up and tested in a research laboratory established at Mellon Institute, Pittsburgh, Pa. Encouraging results with a newly developed resin were soon attained and progress was rapid although, at times, discouraging.

This new resin, although crude at first, was capable of retaining its elasticity at a temperature of zero degrees F. when plasticized and converted into sheets, thus overcoming the one main weakness of the plastics then being used. Finally, after two years of constant research and testing, a highly satisfactory plastic sheet was produced—a plastic sheeting that fulfilled the requirements of the ideal plastic material for laminated glass.

This plastic is produced by compounding Vinylite X, the new resin, and a plasticizer. The resin is an amorphous white powder, and the plasticizer a very high boiling, stable, water-white liquid. After being mixed and colloided, the compound is converted into sheets about .025 in. thick by either the usual method



of calendering, pressing, and planing, or else by the extrusion method. The sheets are then ready to become the protective agent in laminated glass.

This resulting safety glass has not only all of the excellent qualities obtained with other plastics, but also has many properties which were always desired but never heretofore achieved. It is ten times more resistant than previous products to the ½ lb. steel ball drop test at zero degrees F., four times more resistant at 70 degrees F., and three times at 110 degrees F. It has high elasticity combined with unusually high tensile strength—a feature not present in the older plastics. It eliminates edge grooving and sealing, as well as the necessity for the application of heat when it is cut. Also, no adhesive is required for cementing it to the glass. In addition to these properties, tests have shown that it is practically unaffected by sunlight and that it will not decompose in 400 hours at 260 degrees F. whereas nitrate plastic did so in 40 minutes.

This new plastic and its resulting efficiency is surely a far cry from the original of 1905. And the market for it? Well, it looks like the automobile is here to stay.

The Strong Lady of "Jumbo" tests the stretch of a six-inch strip of Vinylite X

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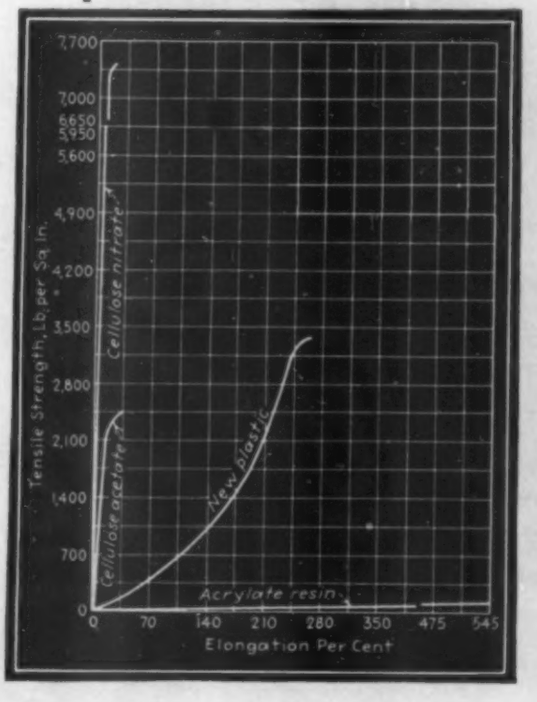

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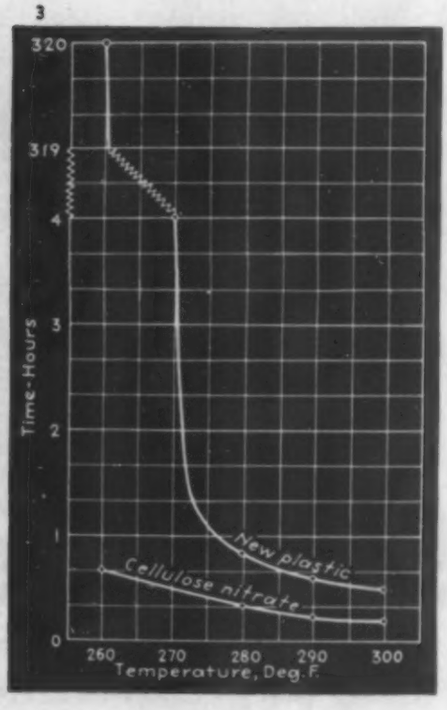

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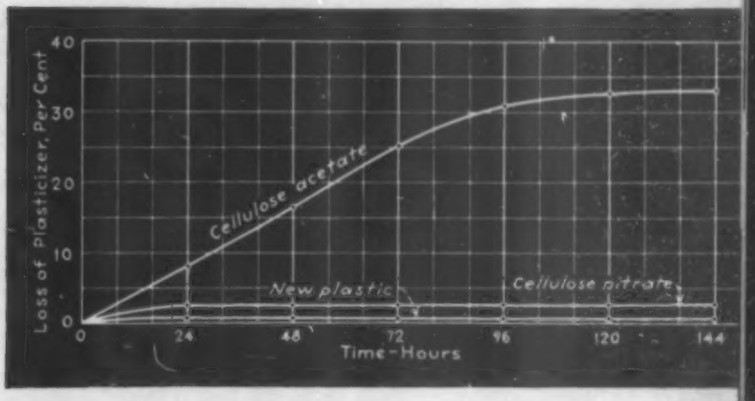
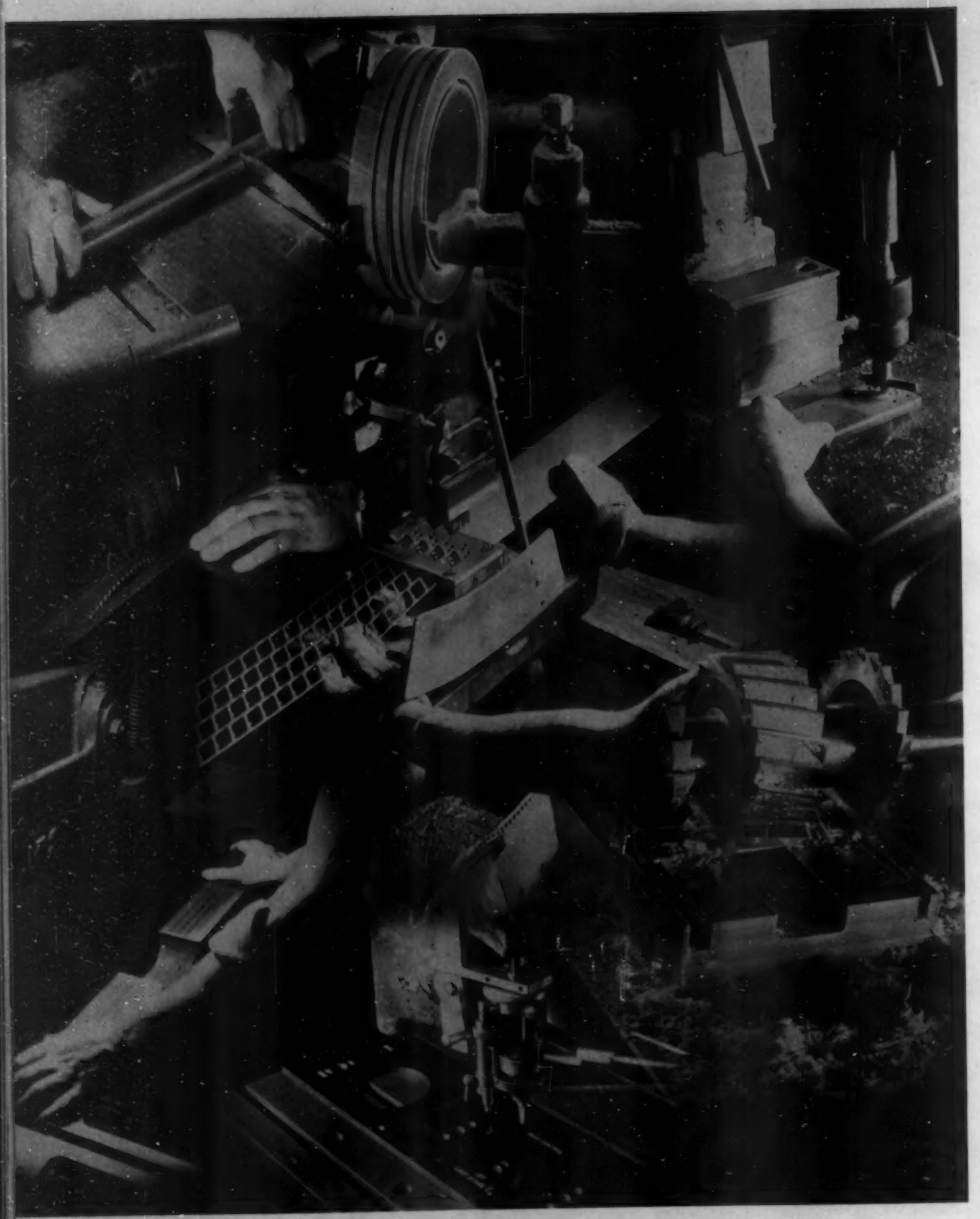


Fig. 1. Vinyl safety glass shows greater resistance to breaks at low and high temperatures. 2. Elongation against tensile strength of plastics. 3. Comparison of stability between cellulose nitrate and new plastic in laminated glass. 4. Comparative loss of plasticizer at 120 degrees Fahrenheit



The intricacies of fabrication

Precision laminating and fabricating for radio

BY EARL W. BEEMAN[1] and I. J. KAAR[2]

RADIO within the past few years has made tremendous strides of improvement in receiving sets, both in reception and in lowered costs to the consumer. It was not so very long ago that one paid from two hundred to six or seven hundred dollars for what was considered a good set and its best performance was usually confined to reception from local stations or those located within a few miles. To bring in a station operating a thousand miles away was considered an achievement. Today, good radio receiving sets can be obtained at almost any nominal price and those equipped for short wave reception have little difficulty bringing in stations located in any part of the civilized world.

Many factors have contributed to these changed conditions. Greater volume of production and sales have influenced prices favorably while radio engineering and design have contributed largely toward improved reception. But back of these two important factors lies the development of new materials and improved methods of fabrication which through steady progress has made them possible.

The successful performance of any radio depends largely upon the perfection of its insulation and the perfection of its insulation depends in turn upon the efficiency of the material used in that insulation and in the accuracy with which it is fabricated and assembled. It is in this vital spot of today's radio that laminated phenolics have established themselves as superior materials.

This position has been reached, however, only after a long period of research and development. Ten years ago almost any type of "punching stock" was acceptable for radio applications—materials that now would not be used for even the simplest and least demanding assemblies. Today there exists that specialization of materials, which naturally follows the necessity of giving predetermined characteristics to fabricated parts to meet tolerance demands.

These outstanding developments in materials might be classed generally under three headings, namely, (1) laminated tubing, (2) triple X laminated sheet, and (3) double X laminated sheet, but it must be remembered that these are group classifications only, and that modifications exist in each group even to the extent that two manufacturers of similar assemblies may require different materials because of individual manufacturing processes.

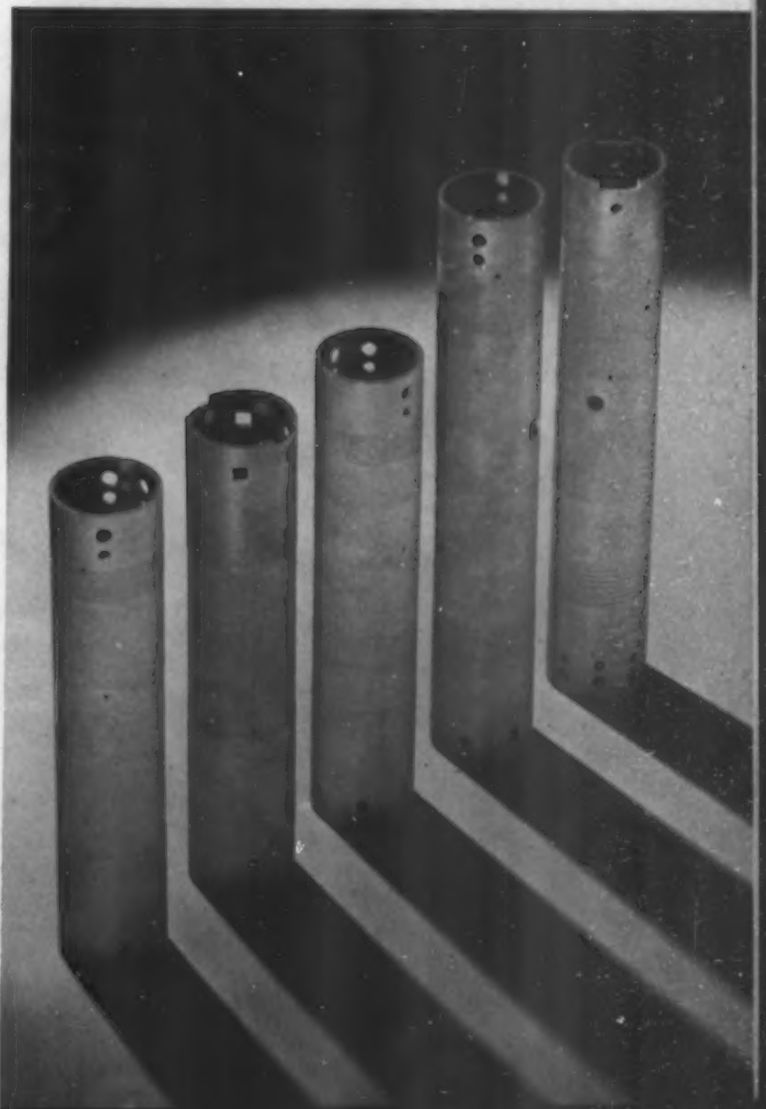
1 Vice-president and sales manager of General Laminated Products, Inc.
2 Designing engineer, radio section, the General Electric Co.

Laminated Tubing

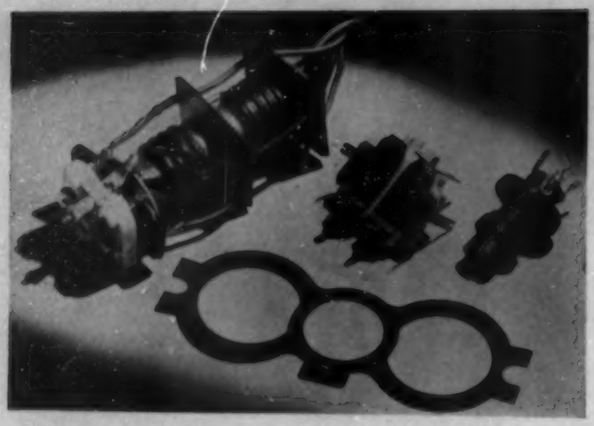
Tubing for radio coil forms should have as low electrical losses as possible at radio frequencies. It should have low moisture absorption, so that the electrical characteristics of the radio coil are not changed after a prolonged exposure to high humidities. The tube must be accurate as manufactured, and must not change shape in subsequent fabricating operations, or after exposure to humidity, etc. Uniformity is, of course, of great importance. Tubing must be sufficiently tough to stand reasonably severe punching and riveting operations, and of a fine enough texture so that threads as fine as 90 per inch can be cut on the outside surface without difficulty. In order to keep the moisture absorption as low as possible, it is necessary to make the tube fairly hard.

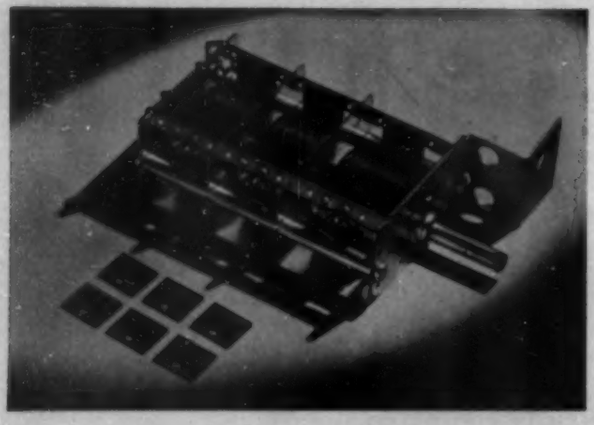
Triple X Laminated Sheet

As in the case of tubing, the highest grade of laminated radio insulation should have low electrical losses at radio frequencies, and as small a change in these properties after exposure to high humidity



Threads vary from 18 to 90 to the inch on these laminated coil forms and their purpose is to locate the wiring which is wound on. Holes are punched with one operation and are held within the very close tolerances of .001 in. Threads must cross holes exactly in the center





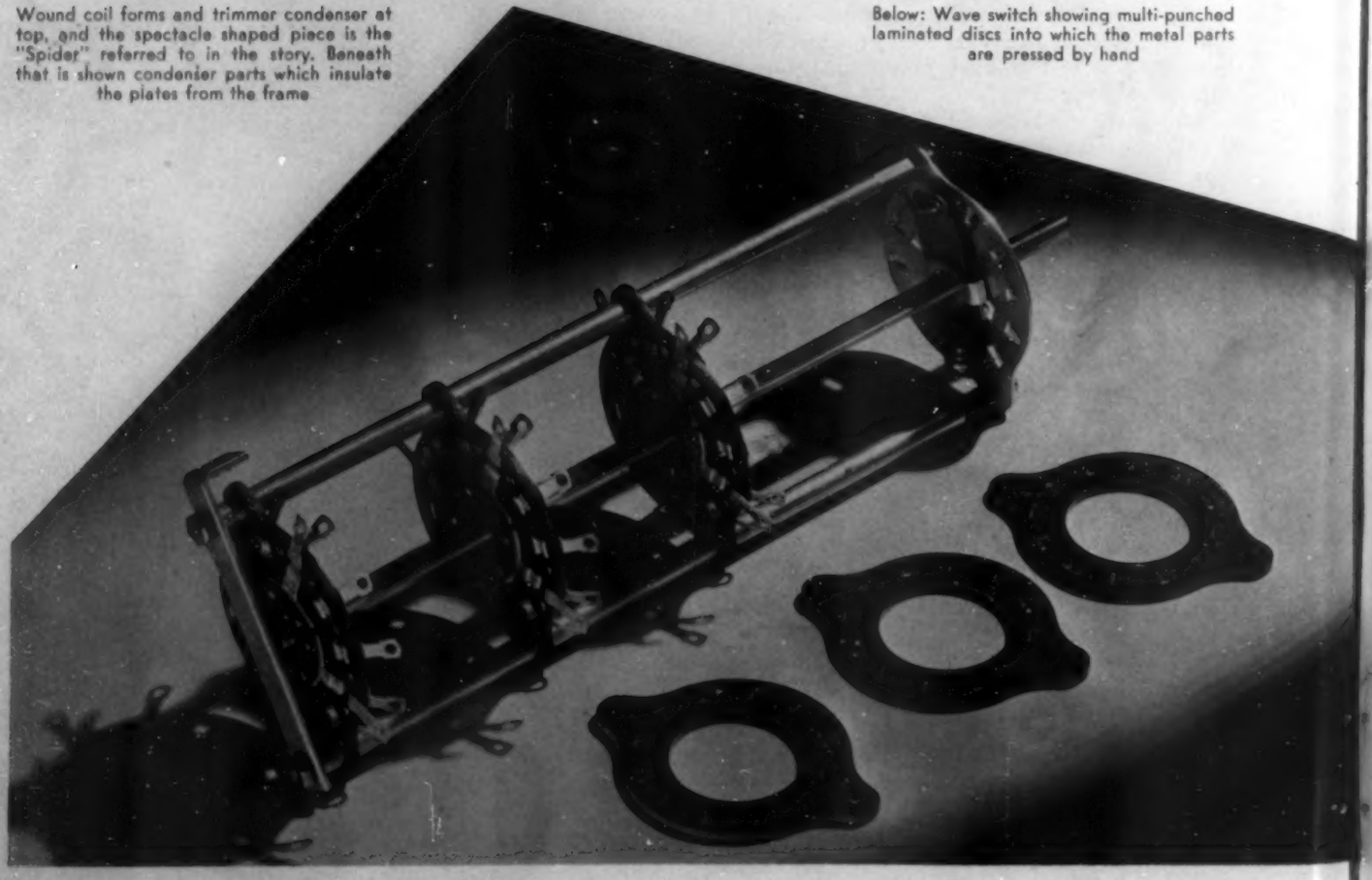
as is possible. In order to obtain these properties, it is necessary to sacrifice something in the way of ease of punching, and make a material which is somewhat inclined to be brittle. Of course this must not be carried to the extreme wherein it cannot be satisfactorily fabricated or riveted. Since most of the material of this type is used in small punched parts for radio receiving sets, where the electrical stresses are parallel to rather than perpendicular to the laminations, it is essential that the losses parallel to the laminations (after long exposure to moisture) be kept at the minimum. Until recently most tests on materials of this type were made perpendicular to the laminations only, and very often a material which shows good electrical characteristics at radio frequencies perpendicular to the laminations is quite inferior when tested parallel to the laminations. This is especially true in radio work.

Double X Laminated Sheet

On many applications in the radio industry where it is possible to sacrifice, to a certain extent, the water absorption characteristics in order to obtain a tougher material which will stand severe punching and riveting operations, a sheet of this type is used. Losses at radio frequencies should be as low as possible and the water absorption also as low as possible consistent with sufficient toughness to withstand punching and riveting operations. For example, in the case of certain switches the fabricating operations are too severe to use the triple X sheet. In such instances the material also must not be too soft or it has a tendency to

Wound coil forms and trimmer condenser at top, and the spectacle shaped piece is the "Spider" referred to in the story. Beneath that is shown condenser parts which insulate the plates from the frame

Below: Wave switch showing multi-punched laminated discs into which the metal parts are pressed by hand



break and loosen up around rivets within a short time.

The radio industry is not unlike the automotive industry in that its peak production is limited to a few months of each year. Because of this fact it is necessary for the fabricator of laminated parts to have sufficient tool and machine capacity to meet peak requirements. The demands for lower production costs have been another contributing factor in the development of specialized high speed equipment, which at the same time meets the demands of accuracy. This demand for accuracy has increased many fold with the increase of high speed production as applied to all radio parts and because of that it has been necessary to design machinery and tools which are practically fool-proof. The human element required with the operation of these machines is almost negligible, once they have been perfectly adjusted.

In this connection it must be remembered that to maintain a given dimension on a laminated part is about five times as difficult as to maintain the same dimension on a metal part because of the nature of the material. Since the radio industry is demanding exceptionally close tolerances on some parts it can be readily seen that new types of tools and equipment had to be designed to meet these requirements.

At one time it was considered satisfactory to use ordinary types of gauges for checking parts, but within the last two years it has become necessary to apply approximately the same standards to large production laminated parts as would be found in a tool shop. For example, we have adopted the use of the Zeiss Microscopic Micrometer which checks not only the dimensions of the part, but also the distance between the punched holes to within .0001 inch. It has become standard practice to use this instrument for tool check of all parts requiring close tolerances.

Wave Switch

As an example of these close tolerances, we might examine a typical wave switch on which there is a series of laminated discs to which connecting parts are riveted with extreme accuracy. These metal parts are hand pressed into holes which have been machine punched with a tolerance which cannot vary more than .001 inch. There are two good reasons for the close tolerances necessary in the manufacture of this part. The first is to insure a close fit of the snap-in parts in assembly. And the second is because after the metal parts have been snapped into place they are machine riveted to insure permanence. This riveting is accomplished on an automatic machine and if the parts are not in their specified position when the operation takes place, the laminated disc would be subject to damage that would render the part useless in performance.

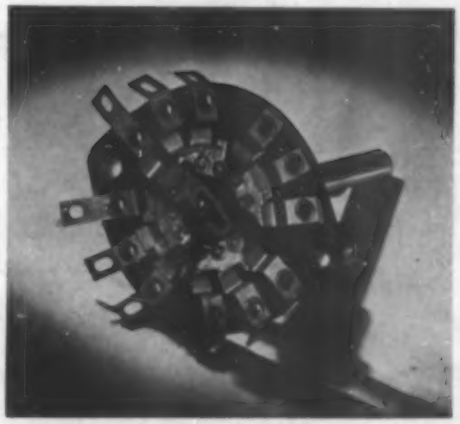
Material for these laminated discs, as in all other insulating parts of radio, must have good dielectric strength and be of low moisture absorption. The reason for this is obvious. Any moisture absorption naturally reduces the dielectric strength of a material, and increases the electrical losses. For this reason, materials used in this and many other parts of today's radio are sufficiently hard to be almost completely moisture repellent to atmospheric moisture. This quality gives the material a brittle tendency which must be reckoned with in fabrication and which makes fabrication within such very close tolerances especially difficult.

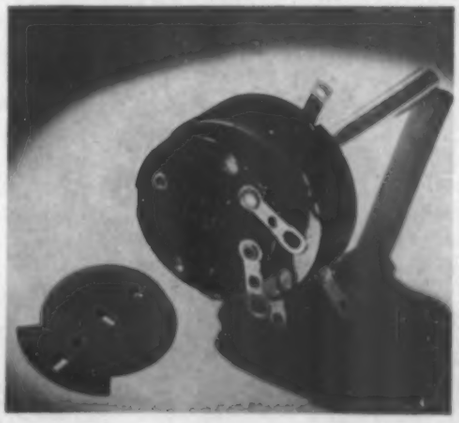
To overcome this brittleness and prevent the parts from being damaged in fabrication, punching is done hot. This means that when the actual punching operation takes place the material is in an expanded state and later shrinks to its original dimensions. This means, too, that holes when punched must be oversize in order that they may shrink to exactly the required size when the material cools. It can be readily seen that to maintain tolerances within .001 in. the coefficient of expansion must be definitely controlled in each grade of material used.

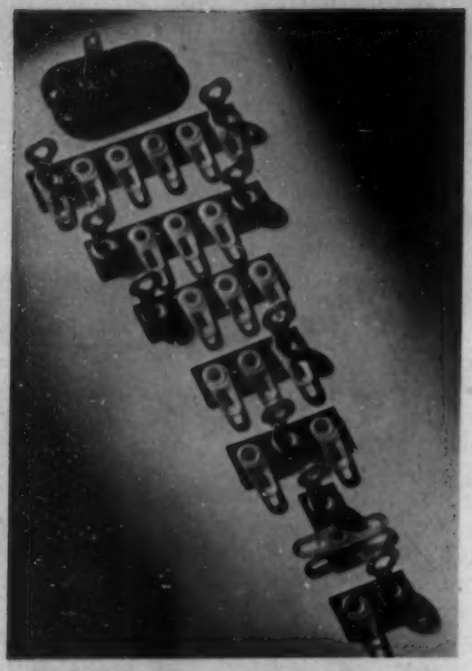
Coil forms

Coil forms used for both intermediate and radio frequency are made of laminated phenolic tubing possessing suitable rigidity to use as a form. Such tubing shall not be subject to changes in dimension or distortion because of moisture it might pick up either in fabrication or service. It must be suitable for machining and fabricating within very close limits. These coil forms are made from tubing $\frac{1}{32}$ in. to $\frac{1}{16}$ in., cut from 3 ft. standard lengths to any required size. They are then inserted in a complicated die, which punches all the required holes from all angles—at a single stroke of the specially constructed press.

Simple switch with laminated disc eyeletted to metal frame. Below: Volume control in which the essential insulative part is a punched laminated disc shown at bottom







Top: Terminal strips must be mechanically strong, fabricated cheaply, and assembled by hard riveting without fracture. Besides this they must give perfect insulation. Next, is a metal tube with laminated washer rolled in on top of the metal shell insulating the shell from the top contact. At the right, are wound coil forms ready for assembly

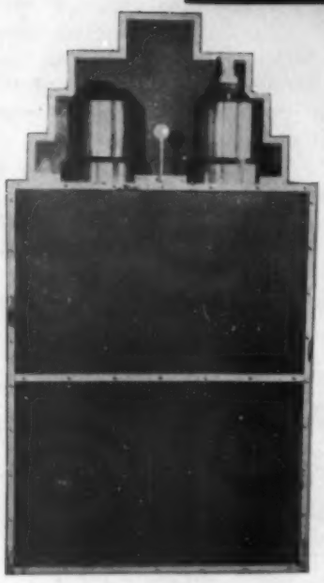
Accuracy here is paramount, because upon the placement of these holes and the subsequent threading operation, depends the length of the wires wound on the coils, its inductance and distributed capacity. Threads vary from 18 to 90 to the inch and their purpose is to locate the wiring which is wound on. The beginning and ending of each spiral thread must come exactly in the center of the punched holes and the root diameter of the thread itself must be very closely held to its required dimension.

Because of its stability and its peculiar insulating qualities, laminated phenolic is the leading material for coil forms, but in order to keep costs within bounds, speed in fabricating must be maintained at a very high level. Special machinery has been developed which threads these coils semi-automatically with a mechanical degree of accuracy which could never be approached if the operations depended in any degree upon human control.

Condensers

In the variable condenser, laminated material is used as a support and insulator between the frame and plates. The requirements of the material are—first, that it shall have considerable mechanical strength and be sufficiently tough to withstand the hard riveting operation that is used in assembly. In addition, this particular application demands probably more from an electrical standpoint than any other application in a radio set, because it is here that a low power factor must be maintained with the smallest possible percentage of change under varying conditions of moisture.

Recent demands of short wave sets have increased the requirements of the condenser to the point where about a year and a half ago it was thought that laminated materials could no longer be used successfully, and that the industry would (*Continued on page 62*)



Machining these 18 in. by 11 in. cylinders was done with ordinary toolshop equipment by a man without previous experience in machining cast phenolics. Below at left, the cylinders are shown in their installed position on the testing machine

Cast resin saves time

Transparency of plastic materials is a virtue rapidly gaining recognition in many industries

REICHEL & DREWS INC., manufacturers of special machinery, models, and testing apparatus were commissioned by a manufacturer of packing for hydraulic rams and similar industrial uses, to make a machine that would allow study and demonstration of the reaction of their packing to different conditions and to observe its workings under such circumstances.

Obviously this called for a machine with a transparent cylinder in which the piston and its packing could be installed and made to operate under actual working conditions. Glass, of course, came first to the designer's mind as a means to this end, but it quickly developed that months would be required to make these special shaped glass cylinders, and the job would be expensive. This started a search that, like so many other searches, led ultimately to the plastic industry for solution.

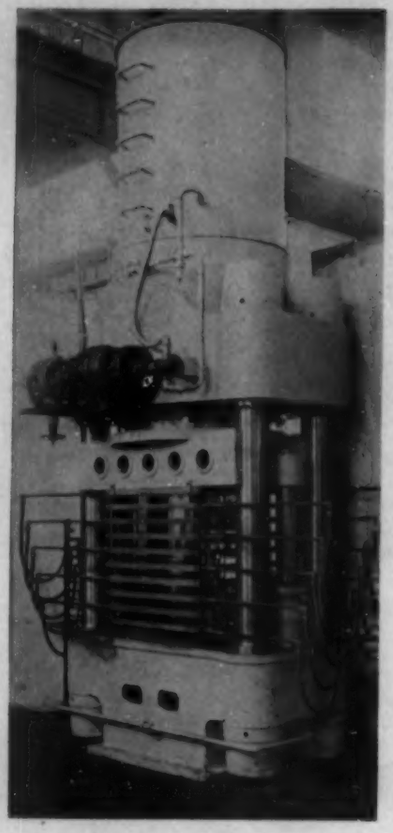
The Fiberloid Corp. was called upon and its engineers, after studying the problem, suggested Fiberlon for these transparent cylinders, this material being a cast phenolic resin that could be made in the desired sizes quickly. The design specified that material and the two cylinder castings, which weighed nearly one hundred pounds each, were actually delivered within fifteen days, and machining began at once. This was quite a job, too. Each cylinder had to be machined to exact size, 18 in. by 11 in. with a 6 in. bore. The castings were machined all over, even to cutting 8 in. pitch threads at the 8 in. and 11 in. diameter, each thread being 2 in. long. They were then polished to a high lustre giving a remarkable transparency even with the 1½ in. wall thickness.

Although the man you see at the lathe had never machined cast resin before, he experienced no difficulty. He produced threads that were absolutely clean and true so that when the plugs were screwed into place they held the pulsations of the air or fluid, as the case may be, without showing a leak. The company executives report that they are pleasantly surprised with the results.

We have illustrated the Hydraulic Testing Machine in its completed form. The *(Continued on page 67)*

Breaker strips ahead

BY A. J. NORTON
DETROIT PAPER PRODUCTS CO.



Specially built press with 56-inch ram large enough to give uniform pressure over entire laminating surface of the sheets being pressed

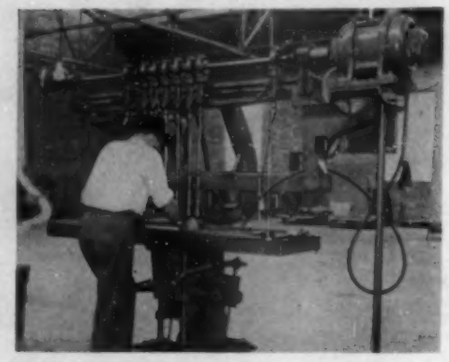
IT WAS not until 1930 that phenolic resin varnish was made free enough from odor to be suitable for use in the food compartments of refrigerators, so frost breaker strips up until that time were made of wood and other materials. Some of them are still made of wood and other materials, but of the 1,700,000 refrigerator cabinets made last year, about 45 per cent. were equipped with plastic breaker strips because they are better for the purpose than any other kind.

Estimates for this year's output of refrigerator cabinets indicate that more than 2,000,000 will be made and that more than 55 per cent. of them will have breaker strips of either molded or laminated phenolic material. Since each cabinet requires four strips, it can be readily seen that the manufacture of plastic breaker strips has become quite an industry itself. Some of the larger manufacturers of household and commercial refrigerators make their own breaker strips but the majority of manufacturers find it more economical to buy them from molders and laminators whose practical experience in handling plastic materials gives them a decided advantage in peak production without the necessary valleys of off-season overhead with which the manufacturer would have to cope.

This independent production is divided among a number of well-known concerns and one of the most recent entrants into the field is the Detroit Paper Products Corp., whose years of experience and knowledge of the refrigeration industry's requirements places them in a position of distinct advantage. For years this concern has been engaged in the successful manufacture of refrigerator insulation and, with the establishment of a new plant for laminating, the company has been able to capture a considerable share of this breaker strip business. Modern equipment and methods have been inaugurated and mass production "line assembly," characteristic of Detroit manufacturing efficiency, has enabled them to maintain production with a minimum of equipment and overhead expense. A new building houses this department.

In order to produce refrigerators at a cost that will make them available to practically everybody, everywhere, the most efficient methods of manufacture are necessary. This means a continuous line assembly of boxes reaching enormous volume at the peak of the season. To serve this industry efficiently, breaker strip production must be geared at the same tempo and travel apace.

A breaker strip serves to insulate the two steel shells of a refrigerator. It must be strong, resistant to moisture, a good insulator, free from odor, and of good appearance. No product has satisfied all these requirements as well as the molded or laminated plastic product. The fast freezing requirements of today result in a strenuous moisture condition that can be met only by a thoroughly homogeneous material of water resistant nature. The combination of this property with the other requirements is particularly found in the phenolic laminated products when made under proper and modern conditions.



There are two general methods employed in the manufacture of breaker strips. The first is molding. This produces a finished strip with many desirable features but the large variety of cabinets multiplied by the number of strips in (*Continued on page 70*)

The housing, revolving explosion chamber and bottom cap shown at the left are cold molded for high heat resistance while the handle above is molded of phenolic for strength and appearance. The Neon light which glows when a fuse sector burns out is located in this handle and lights a tiny insert arrow to indicate the direction handle should be turned to bring a new fuse into place

Where cold molding excels

OF THE many marketable ideas produced during the past few years, not many have attained the immediate public acceptance and meteoric rise in popularity among dealers that this clever little device has won. Not yet a year old (nine months on the market) it is getting around to the tune of 200,000 a month and distribution is growing so rapidly that manufacturing facilities are hard pressed to keep up with the demand.

Ever since our homes have been electrically lighted it has been necessary to protect circuits with fusible plugs to prevent overloading. A short circuit or any sudden or serious overload will heat the soft metal fusible link to such an extent that it burns itself out and the overload stops. Usually no particular damage is done except that the fuse is of no further use and must be replaced before service can be resumed. Right there is where trouble begins, or at least, where inconvenience steps in. When a fuse blows out, it's out and that's that. The lights are usually out, too. The next step is to try to find the burned out fuse and replace it—or send for a service man and wait in the dark. Fuses are usually tucked away in the darkest corner of the cellar, or in the most inaccessible closet one can imagine; and when one does find them, there are usually several all alike and it is no easy job to learn which is the one burned out—especially since each one must be tested separately in the dark.

It is not surprising then, to learn of the warm welcome that home owners have given the Indicator Multiple Fuse which turns replacement into a comparatively tame chore. When *this* fuse blows, a tiny Neon light glows in its cap making identification easy. Since the fuse has six "lives" or six separate fusible links, each in an individually insulated explosion chamber, it is only necessary to turn the cap one notch to the right to bring back the lights and restore order. The plug need not be replaced until all six fuses have been exhausted which in the average household will be about once in two years or longer.

The construction of the Indicator Fuse is as interesting as the service it performs because it involves the replacement of conventional porcelain by molded plastics in an entirely new and revolutionary use. In addition to the metal parts and the tiny Neon tube, two distinct types of plastics are used in the assembly. In order to provide six fusible links in six separate explosion chambers and have them occupy no greater space than one had previously occupied, the designer had to find a material with the insulating qualities of porcelain which could be developed with thinner walls and closer tolerances than were practical with that material. It must be able to withstand approximately 1000 deg. F., the heat generated when a fuse blows. A cold molded plastic was the logical choice for the internal insulating parts and housing, while a molded phenolic was decided upon for the cap and housing for the Neon tube.

Extreme accuracy in molding the housing and revolving chamber is essential (*Continued on page 61*)

NEW IDEAS

● Another instance of the replacement of metal by a plastic material is offered by a German manufacturer of bearings, who has brought out a molded housing for roller bearings. It is made in two fitted parts, shaped so that each engages with the other even to the circular hollow spaces. These spaces are formed while the plastic is hot and are accurately adjusted so that position and shape are correct after cooling. (German Patent 622,860, Deutsche Star Kugelhalter G. m. b. H., Schweinfurt, Germany.)

● German restrictions on the use of copper and zinc (hence also of brass) are helping plastic products to invade this field, formerly protected by a peculiar predilection of the German people for brass or like metals in articles commonly made of other materials in other countries. The recommended practice now is to make such articles with an iron core, over which is fitted a tightly adhering sleeve of celluloid (or cellulose acetate if nonflammability is required). Handles, guard rails, clothes rack bars made in this way avoid all raw materials restrictions, can be made in any desired color effect, do not corrode, retain their gloss without need of polishing, and always feel warm to the hand because they do not conduct heat readily. They are also more resistant to moisture and chemicals (acids and alkalies) than brass or enameled iron. (Plastische Massen, April, p. 136.)

● Molded switchplates and housings for electrical connections are not novel in themselves, but new developments in this growing art are frequent and often ingenious contributions to the use of plastics. Some of the newest designs (described and illustrated with photographs) include a variety of insulating housings, which have several important advantages over metal housings; ribs, crossbars and double walls are used for strength and rigidity and shapes are fitted exactly to the required purpose. Another housing is made for a multiple convenience outlet attached to an electric cord, to permit simultaneous plugging of several appliances at the table (coffee percolator, toaster, waffle iron, etc.). A waterproof eccentric pull switch housing is another item. Molded indicator lugs for supporting high tension cables are made in detachable single and double forms, to be attached to a carrier bar for holding a number of cables. Two important advantages of plastics over metals in these articles are the saving in weight and the resistance to corrosion. (A. Herz, Plastische Massen, April, pp. 120-124.)

● A new synthetic resin material with exceptional mechanical properties is excellently adapted for use in machine parts (silent gears, bobbins, loom parts and the like), as a substitute for wood in furniture and structural parts of buildings, and in acoustical products such as loud speakers and sound records. The new resins are made by a two stage condensation process, first an acid condensation of aniline with formaldehyde, then a condensation with an additional quantity of formaldehyde and another resinifying ingredient which may be urea or a phenol. Fibrous fillers are particularly suitable for making molding compositions from this resin, for the above purposes; paper pulp, asbestos, wood flour and textile fibers are all useful, depending on the properties desired in the final product. (German Patent 622,739, Gesellschaft für Chemische Industrie in Basel, Switzerland.)

● Machine parts and other articles, many of which have formerly been made of metal or other competing materials, are now successfully made of molded plastics, and usually with welcome advantages in economy or performance or adaptability. Examples which are described and illustrated include a spinning head for rayon machines, a reel for textile threads, a blade wheel for pumps, housings for acidproof pumps, a vacuum cleaner nozzle, channeled shapes for holding signs or for like purposes, switch buttons, a number of special shapes for handles, chemically inert containers and apparatus parts for manufacturing or storing chemicals, several structural parts for ships (highly resistant to seawater) and others for aircraft (light in weight but strong), and a number of small parts for sewing machines or other special purpose machinery. (Walter Mehdorn, Kunststoffe, April, pp. 81-86.)

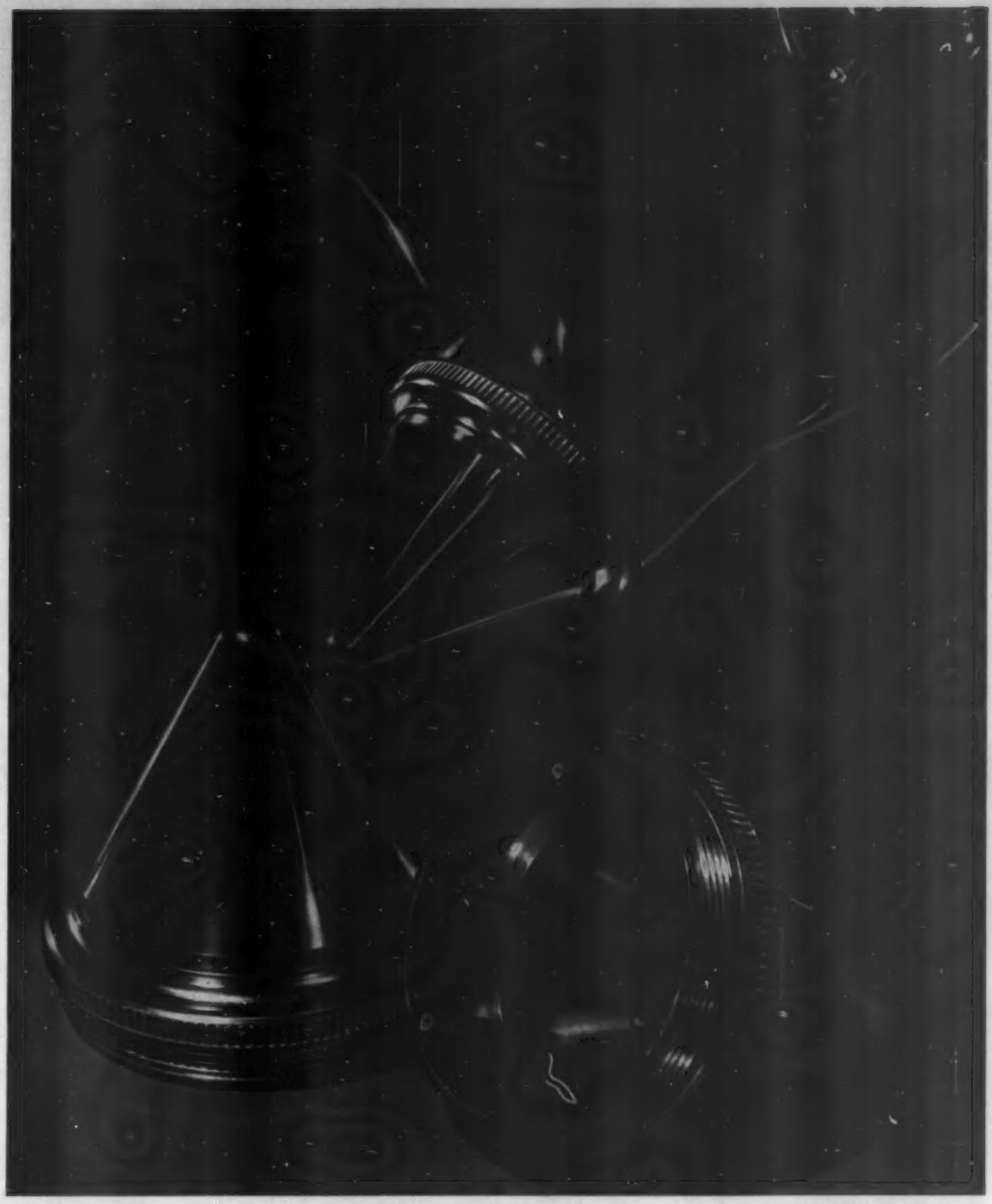
● Any one who has been annoyed by the invisibility of street signs at night will hear with pleasure of an invention designed to make it easy to read the name of any street in a dim light or on the shadowed side of a street light. The lettering is applied to a translucent sheet of cellulosic composition, perforated in closely spaced rows of small holes; this sheet is enclosed between and integrally joined with two sheets of celluloid, sealed at the edges with a suitable sealing composition; and the celluloid in turn is enclosed between panels of glass. The lettering stands out clearly if any light, even a dim light, strikes the sign from either side. (U. S. Patent 2,090,998, Wm. C. Hollister, Visible Night-and-Day Street-Name Signs, Inc., Chicago, Illinois.)

● A new idea for inserting the cork or other liner in molded bottle caps is to provide, at a properly spaced interval under the molded cover for receiving the liner, a horizontal ledge which is not continuous around the entire periphery of the inside of the cap but is interrupted for a substantial portion of the periphery. Once seated directly under the cover the liner is securely held in place by the ledge, which is an integral part of the molded cap. The ledge does not form any part of the screw thread which is molded into the skirt of the cap; it is horizontal and quite independent of the screw thread. (U. S. Patent 2,039,757, Louis A. Von Till, Anchor Cap and Closure Corp., Long Island City, N. Y.)

● A new type of lead cell, with some characteristics of a dry cell in that a paste electrolyte is used instead of a liquid electrolyte, is made with two sponge lead electrodes, properly connected to each other and to the battery terminals by two conductors. The cell has a celluloid casing and a celluloid support for the paste electrolyte; the electrodes extend through this support and are joined below the support by the conductors. To avoid creeping of the electrolyte to the terminals, the conductors are encased in an insulating material. (U. S. Patent 2,038,060, Artur Rudolf, Rulag Battery Co., Ltd., London, England.)

● For decorating or lettering molded articles, e. g. for lettering names on fountain pen barrels or other articles of personal use, a new system has been developed which gives excellent effects while still leaving the surface perfectly smooth to the touch. This is accomplished by cutting or grinding away a portion of the surface to make a depressed area, applying the lettering or decorative design in such thickness that the depressed area is not filled to the original level, then filling in the entire depressed area with a transparent material to give a smooth, uniform surface. This method has the added advantage that the lettering or design is protected from wear even on articles which, like fountain pens, are in constant use. (U. S. Patent 2,037,827, Harry H. Scharfman and Martin Kamen, Chicago, Illinois.)

● The synthetic plastic jewelry trade in Germany, faced with severe competition from the old, long established materials because skilled labor for hand carving is now cheap and because materials costs are high for the synthetic products, is still bringing out new designs and exploiting new ideas. The amino plastics (urea resins and the like) are preferred rather than the phenolic resins when delicate designs in metal foil are to be utilized, as in pendants, lockets and the like. Both press molding and injection molding are being successfully applied. Intricate ornamental designs are being produced, but the artistry of simplicity is not being overlooked. One of the latest tricks of the trade is to set a synthetic gem (phenolic resins are very suitable for these) in a molded fingerring or other setting; amber can be imitated perfectly in this way. (Kunststoffe, April, p. 96.)



G. E. x-ray cone molded of TENITE by the Plastics Division, General Electric Company

TENITE

possesses the essential qualities of transparency to x-rays and high shock resistance which led to its selection for this General Electric dental x-ray cone. The smoothness and warmth of Tenite, which are also factors in this use, adapt it for many other industrial and decorative uses. Write for new 52-page book on Tenite.

TENNESSEE EASTMAN CORPORATION *(Subsidiary of Eastman Kodak Co.),* **KINGSPORT, TENN.**

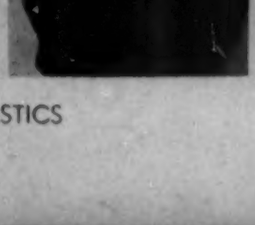
More fun at Buckwood

ON MAY 25 and 26 about seventy-five members of the plastics industry gathered at Buckwood Inn, Shawnee on Delaware, for their second general "get together" and two days of fun.

Interest centered on the golf tournament in which there were nearly fifty entrants on Monday and prizes purchased from a common fund were awarded at the banquet that evening.

In class "A" Allan Brown won low gross; Sanford Brown, 2nd low gross; Gordon Brown, low net; Oscar Meyers, 2nd low net; H. W. Payne, 3rd low net, and Mynders Woodruff, 4th low net. Class "B": Alan S. Cole won low gross; Harold Meyer, low net; Mory Bachner, 2nd low net; C. B. Buckingham, 3rd low net, and Donald Dew, 4th low net.

J. E. Horn won distinction as well as one of the miscellaneous prizes by driving the greatest number of balls into the river. (No one will tell how many.) Orlo Marsh had the greatest number of nines and the most diversified score with a three on one hole and fifteen on another. W. L. Searle had the largest number of eights and J. C. Fuller was awarded the prize for winning the tennis game which it was later discovered was never played.



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Industrial applications where accurate dimensions and close supervision are important receive our careful attention.

CATALIN is furnished by us only as raw material in the form of rods, sheets, tubes and special castings. We do not manufacture finished products and for your convenience, offer herewith a partial list of authorized CATALIN fabricators.

Should you desire any special information on manufacturing problems, our Engineering Department will be glad to cooperate with you and, if required, recommend fabricators in your locality who are suitably equipped to do your work.

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Backstage

Dearborn conference

The second Dearborn Conference of agriculture, industry and science was held in Detroit on May 12-14. The sectional meeting on plastics was held in the Venetian Room of the Book-Cadillac Hotel on Wednesday afternoon with Dr. William J. Hale, consulting chemist, Dow Chemical Co., presiding. Dr. Leo H. Baekland was the guest of honor.

Speakers and their subjects: Growth of the Plastics Industries, William Haynes, Editor "Chemical Industries", New York City: Industrial Utilization of Oat Products, Dr. F. N. Peters, the Quaker Oats Co.: Progress in Plastics, H. M. Dent, President, General Plastics Inc.: Plastics in Housing, R. E. Coleman, Manager plastics department, General Electric Co.

A comprehensive exhibit of farm chemurgic products and processes in the Italian Gardens, ballroom floor, Book-Cadillac Hotel was open each day during the conference. A partial list of those cooperating in the Exhibit follows: American Cyanamid Co., Bailor Mfg. Co., Chemical Foundation, Inc., Celotex Corp. Commercial Solvents Corp., Corn Industries Research Found., Cotton Textile Institute, Dow Chemical Co., E. I. duPont De Nemours & Co., Farm Chemurgic Council, Farmers & Mfg's Beet Sugar Assn., Ford Motor Co., General Electric Co., General Plastics, Inc., Giffels & Vallet, Inc., Klearflaz Linen Looms, Inc., I. F. Laucks, Inc., O'Brien Varnish Co., Quaker Oats Co., Lamont Rowlands, Savannah Pulp & Paper Laboratory, Sherwin-Williams Co., University of Illinois, University of Michigan, Viscose Co., B. F. Williamson Company.

Now national advertiser

A national advertising campaign starting in May, with copy to appear in Time magazine, Business Week, Fortune, Women's Wear Daily, and the House Furnishings edition of Retailing magazine, was announced recently by A. J. St. John of the Celluloid Corporation. At a meeting of the executives of the management group and members of the sales departments of all divisions presided over by George H. Boehmer, general sales manager, plans were formulated for a program which will cover the entire line of Celluloid products with special emphasis placed on Protectoid, a transparent packaging material.

Plastics consultant

J. Earl Simonds, formerly with the Beetleware Division of American Cyanamid Corp. and more recently engaged in establishing a molding plant for the Gorham Co., has announced his plan to set up offices in New York City (address to be announced later) for consulting, advisory and survey services.

His services, according to the announcement, will be available to: existing molding plants which feel the need of outside diagnosis of internal problems; consumers of molded products who have established, or are contemplating the establishment of their own molding departments; firms which are feeling the loss of business through inroads made by plastics; and to firms which have not been concerned heretofore in any way with plastics but are casting about for new fields in which to invest surplus capital and provide production for idle equipment and men.

Mr. Simonds has enjoyed a broad experience covering fourteen years in the plastics field and his intimate knowledge and observation of plant layout, methods, technique, systems, etc., he feels, qualify him to undertake market research, surveys and statistics as well as to render advice and assistance in matters of plants and materials.

New England exhibit

The Worcester (Mass.) Art Museum recently opened an exhibition entitled "Art of the Machine Age; the Challenge of Mass Production" which is intended to show how the requirements in design apply to local products. Since Worcester has for many years been a center for the machine tool industry; and with surrounding towns, a widely known center of plastics fabrication; the exhibition should hold much interest for industrial manufacturers traveling in New England this summer. The exhibition will remain open until October 18th.

Three galleries have been completely remodeled and designed by Walter Baermann, architect and industrial designer, to house the installation of objects and photographs which represent the products of an imposing list of nationally known concerns.

Office and warehouse move

On June 1, the Philadelphia office and warehouse of the Commercial Solvents Corp. were moved from 701 South Front Street to larger quarters in the Terminal Commerce Building, 401 North Broad Street. A complete line of industrial alcohols and solvents will be carried in this warehouse for the convenience of manufacturers in the Philadelphia trading area. E. T. Butler is in charge of the Philadelphia branch.

Detroit office

Tennessee Eastman Corp., announce that they have established an office in Detroit at 914 Stephenson Building. This will be in charge of John G. Slater.

Chemist discusses solvents

Theodore R. Donlan, chief chemist of the Solvents Development Laboratories of the Standard Alcohol Co., delivered an address on "Commercial Petroleum Solvents," recently. The lecture was given before an audience of sixty members of the Baskerville Association, graduate chemistry society of the College of the City of New York.

Mr. Donlan, who was introduced by the guest chairman, Henry G. Moore, chief chemist of the Duralac Chemical Corp., discussed the various methods by which commercial solvents, such as secondary tertiary alcohols, ketones, and ethers are produced from the olefine hydrocarbons of cracked petroleum.

ADVERTISING PAGES REMOVED

Backstage

American plastics on British ship

In constructing the very modern superliner Queen Mary, (which we pictured in our May issue) the architects took advantage of a modern American plastic material for its decorative effect and because it offered a surface of remarkable durability immune to injury by many conditions that would be fatal to older materials.

Stateroom furniture tops throughout the ship, table tops in observation lounge and public rooms, and wherever injury to the surface from cigarets and alcohol might be encountered were covered with blisterproof Formica. One cocktail lounge was equipped with a Formica bar and a wall covering of the same material decorated by inlaid designs. Some 250 bathrooms were paneled with this plastic material because it offered a permanent stain-free surface and was light in weight.

Builders of the ship imported this material because the development of decorative plastics for such purpose has been carried further in America than in Europe and no laminated of comparable qualities was available there according to the Formica Insulation Co., who furnished the material.

Letters from readers

Editor, MODERN PLASTICS:

We noted the article on the Western Union office in your April issue and I wanted to write you a letter about the closing paragraph regarding the use of plastic for the top part of the store front where the sign is. I am sorry that you did not call us to inquire about this matter before printing your comments and criticisms.

As it happened it was impossible to use plastic and light the sign from the rear as you suggest in your article since there was a building construction problem at the rear of the sign. The metal sign is hard against the surface of the store front and there would have been no room for rear illumination. In addition there were a number of other reasons why we could not have used plastics.

I am sure you will not mind my calling this to your attention but I thought you would be interested in knowing the facts. Had you called us before the article went to press I could have told you about it.

Sincerely yours,

Henry Dreyfuss

501 Madison Avenue
New York City

(Editor's note) The closing paragraph referred to was in no sense intended as a criticism of Mr. Dreyfuss' judgment or design—both of which we respect highly. It was rather intended to point out that translucent laminated materials are available for such installations where constructional conditions permit.

STEAM PLATEN PRESS
HEADQUARTERS

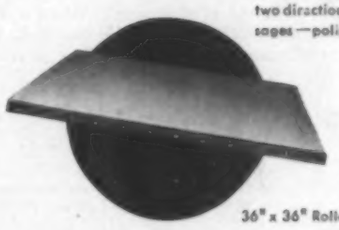
BECAUSE no press is better than its platens, Southwark has always placed major importance upon correct design, the finest materials and extreme accuracy in the machining of Southwark steam platens.

Toward this end, Southwark originally developed and introduced the rolled steel platen, now almost universally adopted, to eliminate the many inherent defects in the old cast iron platens.

To produce the extreme accuracy of alignment and finish of Southwark rolled steel platens, and to machine these plates for the most efficient circulation of steam and water for rapid heating and cooling with uniform temperature distribution and complete drainage—Southwark has evolved many special machines and methods for shaping, finishing and drilling steel plates, exclusive to Southwark.

In addition, special patented port closures, flexible pipe joints and other fittings have been developed by Southwark to insure the most satisfactory service which can be offered users of steam platen presses.

Rolled Steel Steam Platens with surfaces curved in two directions. Drilled passages—polished surfaces.



36" x 36" Rolled Steel Steam Platen.

BALDWIN-SOUTHWARK CORP.
SOUTHWARK DIVISION, PHILADELPHIA
Pacific Coast Representative:
THE PELTON WATER WHEEL CO., San Francisco

SOUTHWARK

CRESYLIC ACID

CASEIN

Dibutyl Phthalate
Diethyl Phthalate
Dimethyl Phthalate
Triacetin

AMERICAN-BRITISH CHEMICAL SUPPLIES, Inc.

180 MADISON AVE.,
NEW YORK, N. Y.

The most modern molding press will be inefficient

UNLESS . . .

A COLTON PREFORMING
machine backs it up!

Colton Preforming Machines are the accepted standard in the plastics industry not only because they speed up the molding cycle but because their unvarying accuracy of performance is a guarantee of better molding at the press. When Colton preform-pellets are used material waste is eliminated, flash is held to the ideal minimum, material handling problems are simplified and costs d
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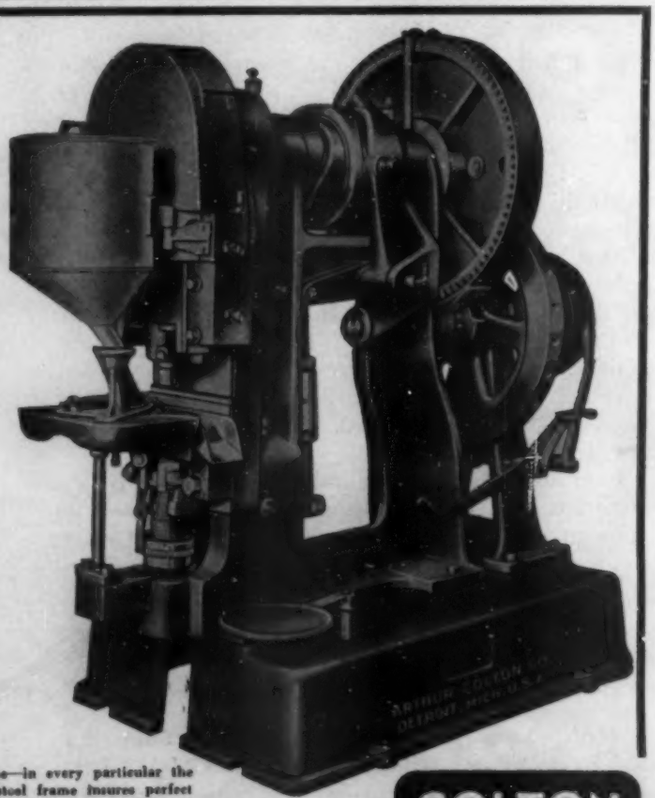
p!

Write us for full details about our complete line of single punch, multiple and rotary preforming machines.



ARTHUR COLTON CO.
2604 E. JEFFERSON AVENUE
DETROIT, MICHIGAN

The new, improved 5½ tablet machine—in every particular the finest the market has to offer. Solid steel frame insures perfect operation; improved die fasteners, improved cam construction, heavier ejecting mechanism, vanadium steel plungers—make high speeds possible without fear of breakdown or lowered quality. Makes tablets up to 3" in dia. having a fill depth up to 2¼".

COLTON
DETROIT

Books of the month

Stock mold catalog

Auburn Button Works has just issued an eight-page leaflet showing photographic illustrations of various objects available from stock molds. Among them are boxes, cigaret cases, ash trays, radio knobs and dials, coasters, clock base, miscellaneous knobs and wall plates. Any manufacturer interested in products from stock molds should write us for one of these leaflets.

Handbook for engineers

The Standard Handbook of Refractories, a 48-page manual of information for engineers, plant superintendents and others interested in the control of heat, has just been published by Standard Fuel Engineering Company. It is full of information about refractory cements, refractories, heat treating and other furnaces, as well as a copious assembly of useful tabular material of interest to those whose use of refractory materials requires specific formulae. It is unusual in that it includes not only data not often published in the precise combinations selected by the publisher but has been printed in a format which makes the book a handy manual for active engineers.

Oil soluble resin

General Plastics Inc. announce that their 1936 edition of Durez Oil Soluble Resin booklet is ready for distribution. We will gladly mail a copy to anyone in the paint and varnish industry who is interested—no charge of course.

Plastic products folders

Kurz-Kasch Co. has just issued two four-page folders showing their plastic products from stock molds. One is devoted to serving trays, ash receivers, match holders, jewel boxes, cigaret boxes and candy and utility boxes. The other, in full color, illustrates the company's line of stock boxes for cosmetics in actual size. We will gladly send copies to those interested.

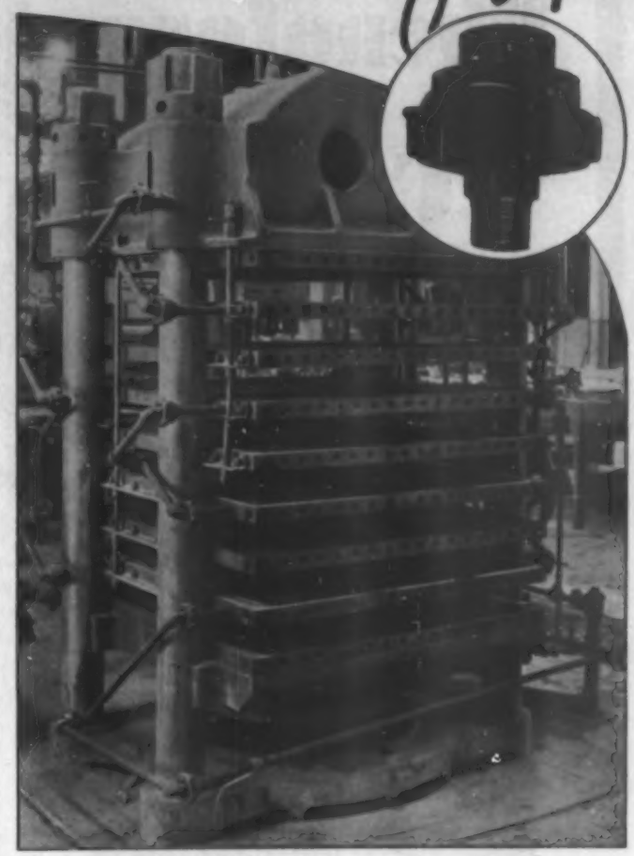
Workshop Receipts

5 volumes @ $2.50 per vol. or $10.00 the set
Chemical Publishing Co. U. S. Distributors
Published in England

For the home craftsman, whatever his occupation or manner of living, here is a complete set of reference volumes of immeasurable value. Many copies of these books have been sold in England, but they are now available in this country to chemists, engineers, scientists, executives, colleges, manufacturers, farmers, mechanics, home experimenters, and home owners. Although the volumes contain many formulas, they are not formula books. They detail processes, manipulations and handy methods which are the result of years of experience of practical experts. For the first time there are revealed many invaluable trade processes and secrets. Explicit details and many hundreds of illustrations are given to make them interesting and helpful.

The volumes average over five-hundred pages to the

WHERE
LONG LIFE Pays



THE constant action of platen presses, molds, and vulcanizing machines imposes heavy responsibilities on their flexible pipe lines. Barco Joints are the type which have proven they are able to "take it" under severe service conditions. They will not leak, even under extreme temperature variation. Their construction is such that gaskets will not blow out. Yet they turn freely through 360°.

Performance like this has an actual cash value. Not only is there a positive saving from low maintenance costs, but freedom from shut-downs increases the money-making value of the equipment on which they are used.

BARCO MANUFACTURING COMPANY
1813 Winnemac Ave. Chicago, Ill.

BARCO
SWIVEL
JOINTS

Write for Catalog 255

Phenoform

Colors

A wide range of colors for plastic compounds — especially selected and prepared to meet the most exacting requirements in molding. For particulars apply to

General Dyestuff Corporation

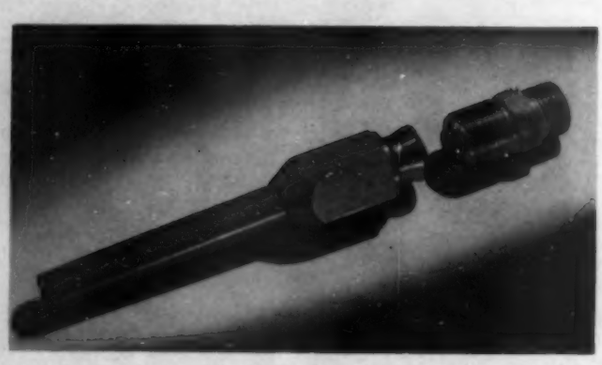
230 Fifth Avenue, New York, N. Y.

Books of the month

book and cover almost all imaginable subjects. Whether you are interested in acetylene lighting, alcoholometry, bamboo work, basket making, bitters, blackboards, celluloid substitutes, china riveting, dew ponds, distilling, earth toilets, engraving, freezing mixtures, hydraulic rams, inks, ivory, key cutting, lacquering, marbling paper, perfumes, pipe bending, pottery, photography, razor paste, sewage disposal, walking sticks, or wire ropes, you will find them all treated in detail in these highly informative books which cover more than three-hundred separate subjects.

Union-effect fittings

Packless Metal Products Corp. offer economy to users of air-hose through their self-applied union-effect fittings. No soldering, brazing or packing is required and a simple operation using only a vice, pliers and hammer, quickly joins either flexible or fixed tubing with other tubing or fittings as may be desired. The fitting consists of three parts which may be used over and over again whenever tubing needs to be replaced.



They also make a self-applied fitting for copper tubing which is illustrated here. Its operation is exceedingly simple in that the copper tubing is simply slipped through a hex-nut and a split collar and then assembled. Tightening the connection automatically flares the copper tubing and makes a perfect fitting. Circular available.

Chlorinated rubber

An address on Tornesit, given recently by A. R. Olsen of the Experimental Station of Hercules Powder Co., before the Paint and Varnish Production Club in Boston, has been published in booklet form. Tornesit is the trade name of a chlorinated rubber product now being manufactured and marketed by the Company. Because of its unusual properties, the material is of interest to the protective coatings industry.

The booklet outlines the general properties of Tornesit, discusses solubility, plasticizers, resins, pigments, application, emulsions, chemical resistance, etc., and winds up with suggested uses and a short paragraph about its future. The booklet will be sent to any of our readers requesting it.

Stokes

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PLASTICS

"The picture tells the story."

STOKES Plastics have a beauty of finish, a precision of line, an accuracy of detail that indicates care and skill in every manufacturing process. Let our plastic molders solve your problem.

Molders since 1897

Jos. Stokes RUBBER CO.
Trenton, N. J.
Canadian Plant, Welland, Ontario

SINCE 1918

PLASTIC MOLDS

HAND
AUTOMATIC
SEMI-AUTOMATIC
and EXTRUSION
to the
LATEST METHODS

Designers and builders of all types of PLASTIC MOLDS.

Serving most of the leading molders in the country.

Our 1500-ton hydraulic Hobbing Press adds many advantages in obtaining LOWER MOLD COSTS.

Estimates on request.

EAGLE TOOL & MACHINE
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37-39 Freeman Street Newark, N. J.
Phones: MARKET 3-1572
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Simplify It!

Simplification of complex parts is another thing we understand from our long experience in the molding business. This keeps material and mold costs down; makes for greater strength and beauty.

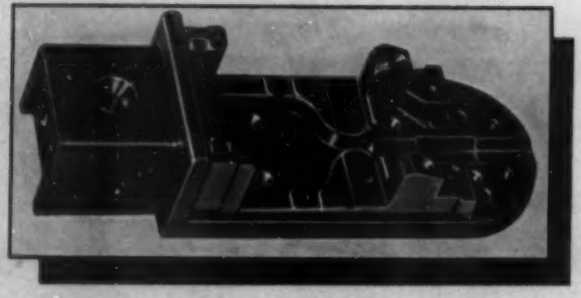
Whether the job is simple or complex, our designers and engineers will handle it RIGHT for you. And our plant, one of the largest, will follow through on production.

Write us!

AMERICAN INSULATOR CORP.

NEW FREEDOM, PENN.

ACCURACY!



The above interesting illustration of a piece for which original dies and moulding were done in our plant show the need for the extreme accuracy for which this company is noted. If your problem is one involving unusually difficult features, we would welcome the opportunity of discussing it with you.

Kuhn & Jacob

MOULDING and TOOL CO.

1200 Southard St., Trenton, N. J.

New York Office, Penna 6-0346 Phila. Office, HANcock 0972

Books of the month

"The Beetle Magazine"

The British Cyanides Co., Ltd. has sent us a copy of its official house journal "The Beetle Magazine." The publication made its first appearance shortly before Christmas 1935 as an unofficial and chatty journal to promote better acquaintance and friendliness among the personnel of the various companies of the organization. It created such an excellent impression that it received directorial recognition and was adopted by the parent company as its official journal. This is the first issue under its new auspices and publication will be three times a year—Easter—midsummer and Christmas.

The tone of the journal is well expressed on its editorial page, from which we quote: "The firm will gladly send copies to its friends and customers (and we hope all the latter are included in the former) at home and abroad, and if the magazine helps each to know the other better and to feel in closer touch with the other, then it will be serving its purpose and justifying its continuance."

Jubilee booklet

Ranges that will electrify America are featured and illustrated in a new booklet published by Westinghouse Electric and Mfg. Co. in celebration of its golden jubilee. The booklet, which is attractively done in rotogravure, displays interesting applications of plastic materials both for decoration and convenience on 1936 electric stoves.

Underwriting manual

Underwriting and valuation procedure under title II of the National Housing Act is described in detail in the Underwriting Manual published by the Federal Housing Administration. Complete information regarding organization, methods and estimating are carefully outlined with the purpose of promoting a broad understanding of the underwriting and valuation principles adopted and advocated by the Federal Housing Administration.

Clean, decorative and inviting

(*Continued from page 32*) decided advantage over marble counters which became pitted and marked within a short time from spilled phosphates.

In their new designs, the Russ Co. uses the wide variety of colors available to provide a selection that will harmonize with any store interior, or if desired, provide a contrasting combination that will set the soda fountain apart from other fixtures. Cool blues, quiet greens, vivid reds and many other tones are used to make their new exterior groupings among the most attractive on the market today. Full use is also made of opportunities for metal and color inlays. Such inlays are heat-compressed into the face of the plastic material leaving the entire panel section

free from cracks or crevices. There are no unsightly joints or indentations to catch or hold dirt, making it a simple matter to keep the fountain front and top spotlessly clean.

Over forty-five different combinations provide a range of adaptability that meets every service and decorative demand. Russ Soda Fountain Co. find the versatility of Formica definitely advantageous in planning new installations and their experience shows that the finished cost represents a figure that is competitive with other good quality materials.

Where cold molding excels

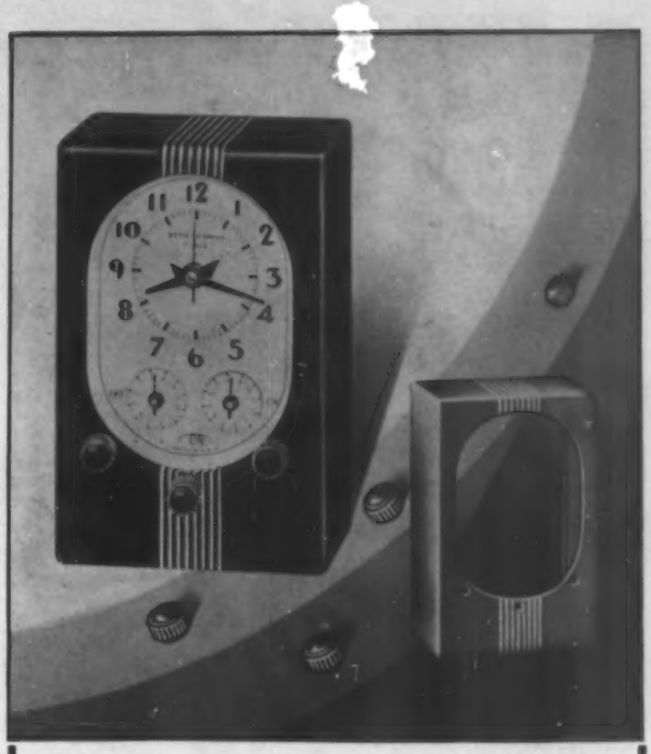
(*Continued from page 47*) in order that the heat generated by a burning fuse will not escape sufficiently to affect those in adjoining chambers. The heat generated must be dissipated instantly without penetrating the thin walls and cold molded is ideally suited to this use. It must also withstand the devastating force of the short circuit test necessary to merit approval by the Underwriter's Laboratories so essential to its introduction and eventual success.

Molded phenolics were chosen for the Neon housing and cap which also serves as a handle for turning a new fuse into place, because it has greater impact strength and presents a more finished appearance than cold molded plastics usually have.

The combined assembly assures perfect insulation and renders the operation of replacing a burned out fuse as harmless as switching on a light. It is impossible to become shocked or burned by turning the handle for fuse replacements and the Neon light which continues to glow as long as the burned-out fuse remains in place, makes it easy to see just where the handle is located. As soon as the handle is turned and a new fuse is in place the Neon light ceases to glow until another fuse has burned out.

F. A. Schiller, president of the Indicator Corp., is responsible for the idea. He says: "It just popped into my head one night when I became exasperated with a burned-out fuse. I made up my mind then and there to do something about it and when I decided that plastics of some sort would be the best material to use, I took the idea to the Garfield Manufacturing Co. Together with our own engineers, they worked out the housing and interior insulation of the Indicator Fuse and are molding them for us. We chose Durez for the handle because it had a better natural finish and greater strength than most cold molded materials."

The fact that Mr. Schiller is also president of the Claude Neon Co. is probably responsible for the added convenience of the tell-tale light which marks the Indicator Multiple Fuse as one of the most outstanding household conveniences that have been placed on the market in many months. Although less than a year old, this device has become well established through broad distribution. The Western Indicator Co., recently established in Chicago, is serving thirteen midwestern states. Jobbers are handling sales in the south, and assembly lines at the home plant in the east are humming feverishly trying to keep pace with the demands.



Seth Thomas

TRADITIONS

of Quality and Accuracy

Achieved In Plastics by

CONSOLIDATED MOLDERS

Traditionally famous as makers of dependable time pieces, Seth Thomas turns to Consolidated plastics for case beauty and utility. The Arcolite timer case shown here is a striking example of Consolidated's molded plastic contribution to Seth Thomas' modern styling. Proving again that products encased in Consolidated plastics have greater beauty and durability . . . increased sales appeal!

PRECISION MOLDERS IN ALL PLASTIC MATERIALS

SCRANTON BUTTON

CONSOLIDATED MOLDED PRODUCTS CORPORATION

Formerly Molded Products Division of American Record Corporation

General Offices and Factory: Scranton, Pa.

New York :: Chicago :: Detroit :: Rochester :: Cleveland

ECONOMIZE

Use "P.M.P." Self-applied Union Effect Fittings

No Soldering—No Brazing No Packing

Easily and quickly applied and re-applied. Save the cost of fittings each time a length of hose is replaced.

Cut the "P.M.P." Seamless Flexible Metal Hose, which is supplied in long lengths, to the desired length and slide on the fitting part A. Slip the braid back at B and screw on the threaded split ring C until the hose projects ½ in. to 1 in. beyond the end of the ring as at D. Bring part A toward C until it comes against the braid around C, place in a vise and tap the end of the hose with a hammer to compress the projection D until the hose corrugations are closed flat against C. Slide nut E over male end F and screw E on A to bring F tight against D and to push C into its taper seat in A. Part E can then be loosened slightly to allow F to swivel as in a union when it is desired to line the connected parts in exact arrangement.

Result—"P.M.P." Solderless—Brazeless—Packless, Self-applied fitting. Patents granted and pending.

Packless Metal Products Corp.
35-30 Forty-second St., Long Island City, N. Y.

Precision laminating

(*Continued from page 44*) have to change over to other types of material, such as ceramics. Ceramic materials while almost ideal from an electrical standpoint, offer many obstacles in low cost fabricating, and involve a large percentage of breakage losses incurred in breakage on account of their brittleness.

However, General Electric Co. met the situation by developing a special grade of material, which from a standpoint of low power factor and small percentage of change under adverse conditions, was much beyond anything on the market up to that time, and it has successfully met all requirements of the industry. At the same time they instigated a new line of thought in testing materials for electrical or dielectric strength with the laminations rather than through them. This is because in nearly every radio application the insulating qualities of the material are not demanded between the top and bottom of the piece but rather along its surface, and laminations between rivets, screws, or contacts, which are assembled through the various parts on the same surface, and which must be insulated from one another.

Metal tubes

With the advent of metal tubes, the laminating industry has found an additional application where these materials have been able to further reduce costs while rendering a superior service in the matter of insulation and reduction of breakage. This applica-

Complete Line of
Machinery For Celluloid And Plastics Mfrs.

JOHN J. CAVAGNARO

HARRISON · Engineers and Machinists ESTABLISHED 1881 · NEW JERSEY

Special Representative
Evarts G. Loomis
126 So. 14th St. Newark, N. J.

Cavagnaro-Loomis Vacuum Mixer
(Patented)

CLASSIFIED

HYDRO-PNEUMATIC ACCUMULATOR—For Sale—One Watson-Stillman Accumulator, high and low pressure, complete with air compressor, air receiver, motor driven high pressure horiz. and low pressure vertical Pumps; also Hydraulic Presses, 27" x 46" and 12" x 12" platens. Reply Box 134, Modern Plastics.

●

DEVELOPMENT ENGINEER—Graduate Mechanical Engineer. Experienced in Electrical Appliances, Small Motors, Molded Plastic Applications and Mold Design. Familiar with costs, production, design, styling, patent, research problems and procedure. Executive experience. Reply Box 158, Modern Plastics.

●

WANTED—PREFORM MACHINES—Will pay cash for idle or surplus preform Presses—also Hydraulic Presses, Pebble Mills, Mixers, Sifters, etc. Send us your list. Consolidated Products Co., Inc., 13-14 Park Row, New York City.

●

FOR SALE: Surplus hydraulic presses. Two with double rams, self-opening and 8' x 3' platens. Twenty smaller ones. Also two Terkelsen automatic. Priced low. Reply Insulation Manufacturing Co., Inc., New York Ave. & Herkimer St., Brooklyn, New York.

●

WANTED—Practical chemist on acetate moulding and injection powders with shop experience. Reply Box 156, Modern Plastics.

●

WANTED—Man with experience in making rubber, soft packing and plastic materials and finished plastic products. Should have thorough knowledge of synthetic resins and hydraulic press work. Must be experienced in carrying on research work. In your original letter give experience and education in detail; also state where last employed, age and salary expected. Give references. Permanent for right man. Reply Box 157, Modern Plastics.

tion—although apparently simple since it consists only of a small washer which is rolled in on top of the metal shell insulating the shell from the top contact—is very important because the functioning of the tube depends largely upon the success of the insulation used. The application itself is similar in its requirements to the parts used on variable condensers.

In fabricating this piece a multiple impression die is used and operated on a special high speed press which hitherto has been adapted only to metal and fibre fabricating on which the material could be run from rolls instead of from strips as is necessary in the laminated industry. This problem of feeding the material in 3 or 6 ft. strips into a special high speed press, which actually makes 300 impressions per minute, cutting four parts at each impression, is one that was difficult to work out in a practical manner but is now operating successfully.

Sockets and terminal strips

During the past few years various attempts have been made to adapt molded materials and others to radio tube base sockets but none have been found which met the requirements and which are cost competitive to the laminated socket which consists of two laminated punchings assembled with from 4 to 8 contacts.

The primary requisite in this instance is a material which can be fabricated economically but at the same time is mechanically tough and will withstand riveting operations necessary in assembly and stresses incurred in placing tubes in sockets. Originally it was considered necessary to use a material at least partially cloth base in order to get the necessary mechanical strength but recent improvements in toughness and flexibility of paper base material have made it possible to use this exclusively at a reduced cost.

The various types of terminal strips have almost identically the same requirements as sockets. In other words, there is needed a mechanically strong material that can be fabricated cheaply and assembled with various types of contacts by hard riveting operations, which do not fracture the material or cause surface cracks, yet give perfect insulation because the socket is required to meet the same conditions as the tubes.

Similar to the socket is the base plug used on the automobile radio vibrator. This part consists of a fabricated laminated disc to which are assembled from 4 to 7 pins similar to those used in radio tubes. This application is particularly difficult because only one thickness of laminated material is used and because in eyeletting the pins to the laminated material stresses occur which have a tendency to warp the laminated disc unless absolute accuracy in punching an assembly is maintained.

Volume Control

In the volume controls, one of the essential pieces of insulation is a small fabricated part which is used as a component part of the rotor assembly. This piece must be free from moisture absorption to prevent warpage and loss of electrical qualities. The main case of the volume control is molded phenolic which functions not only as a good looking and substantial housing but also as insulation for the entire device.

Cavity Temperatures
may vary in the same mold

When this happens you are bound to lose uniformity of texture, form and color. It is therefore a worthwhile practice to check the temperature of all cavities at least four times a day with a Cambridge Mold Pyrometer. It takes but a few seconds of the molder's time and it gives him a positive means of instantly discovering any water logging of the mold.

Cambridge Instrument Co., Inc.,
3732 Grand Central Terminal,
New York City

CAMBRIDGE
Mold · Surface · Needle
PYROMETERS

Send for details of these instruments. They will help save money and make better plastics.

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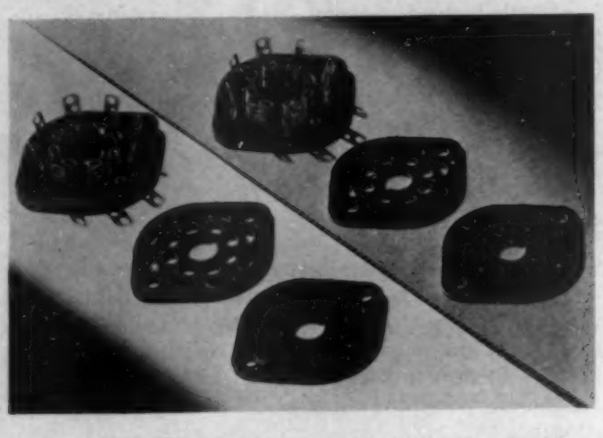
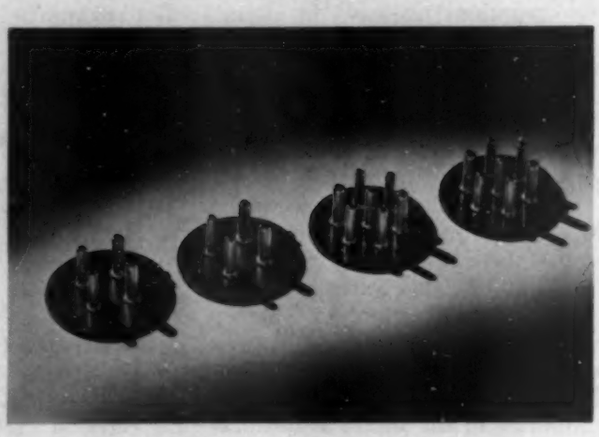
Miscellaneous

Laminated material is used in innumerable spots of today's radio because of its electrical characteristics and mechanical strength in these miscellaneous applications. Speaker parts which include the spiders are examples worthy of mention. The spider is a fabricated piece which must be exceedingly thin because of the flexibility required in its use as the cone center of suspension. This piece actually must meet strenuous vibration tests inasmuch as it is constantly vibrating while the speaker is in use. To withstand the constant vibration and at the same time to give sufficient mechanical strength for support of the parts, a fine weave cloth base material is used. Because of its function in the true reproduction of sound, the part itself must be held within close tolerances both as to thickness and other dimensions.



Tube sockets must be cheap but rugged. These are assembled from two discs of laminated phenolics with paper base eyeletted to hold inserts firmly in place



Base plugs used on the automobile radio vibrator. These parts consist of a solid laminated disc to which are assembled 4 to 7 pins similar to those used on radio tubes

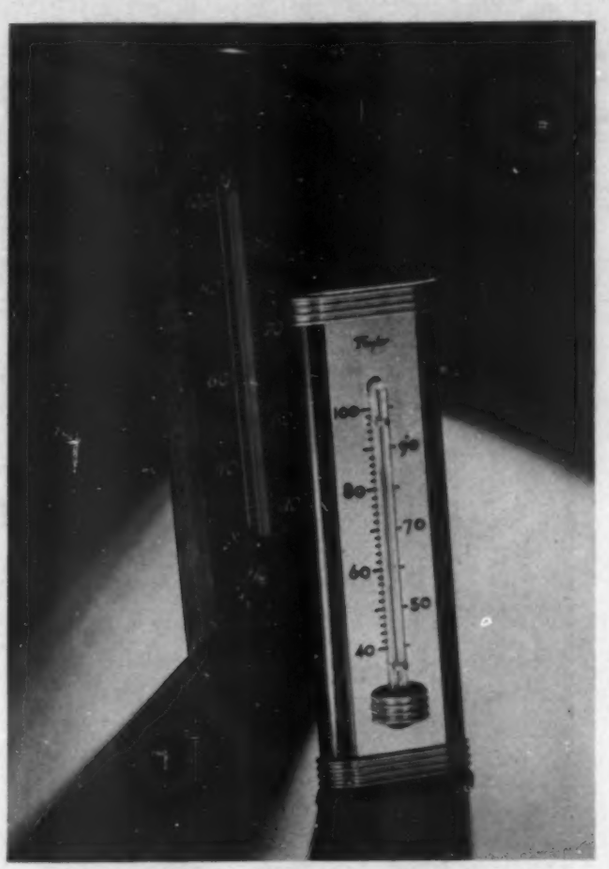
Flexible resistors

Paper base laminated material is used which is fabricated in the form of strips ½ in. to ¾ in. wide. It is necessary that these strips be bevelled on both sides for the winding operation with very fine wire. This particular application presents an additional require-

ment that the material itself must be sufficiently flexible so that after the wire is wound the entire piece may be formed into practically a full circle without cracking or breaking.

And so we could go on through each vital part of radio assembly where laminated phenolic materials in both sheet and tubular form have contributed so much to this rapid development. Perhaps the greatest contribution has been the part they have played in bringing extensively improved radio reception within the means of those who get the most benefit from it.

Inviting sales through redesign



Wall thermometers too have been redesigned for greater attraction and utility. The model in the foreground is being made of wood for trial, but when public acceptance warrants it, it will be molded of plastic material

(*Continued from page 17*) surface which, combined with the chrome plated trim, makes a permanently durable finish on the entire instrument.

"Such a complete change," says Mr. Brown, its designer, "has already been reflected tremendously in the interest shown in the office model by physicians who recognize in the improved design both utility, as represented by a much easier reading dial and pointer, a better method of attaching accessories, a characteristic of staying where it is put, and appearance harmonizing with furnishings and appointments."

It is the plan of this Company to continue with its program of modernization. Take for example the wall thermometer shown on this page. The new form is definitely more suitable for the average home in that

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it is less obtrusive. It is to be produced in combinations of walnut and ivory with gold trim and blue with silver trim, giving an opportunity to obtain an instrument in keeping with the surroundings for which it is selected. As soon as customer acceptance has been determined, these too, will be made of plastics.

Neons become flexible

(*Continued from page 27*) Lightness of weight for easy portability was one of the main reasons for choosing plastics, according to the Neosign Corp., manufacturers of the unit. The molded housing proved lighter than any other material under consideration—an important selling point where it is used with travelling displays. Then too, the molded case, being a non-conductor, eliminated the need for grounding the housing, which would have compli-

Neosign, with its molded frame and neon tube screen, makes quick changes possible for the first time with this style of brilliant and attractive lighting

cated installation and limited its portability. This self-insulation feature of plastics simplified mounting the wires, tubes and switches as well.

Rough usage and scratching was another consideration, especially for display booth and exhibit use, which dictated the use of phenolics for the molded frame and housing. Unlike enamelled metal, the integral finish of a phenolic molding cannot chip or

scrape off because it is actually part of the piece, and the Neosign will look as new and shiny after years of use as it does when new. For outdoor uses, such as theater box offices, weather resistance was an important point. The joints and seams of an enamelled stamping are breeding places for rust which are neatly avoided by the use of plastics. They resist atmospheric attack and will not rust or peel when exposed to moisture.

Cast resin saves time

(*Continued from page 45*) transparent cast resin cylinders are mounted on a cabinet containing the necessary mechanisms to test both hydraulic and compressed air packings. Both the air and fluid are used under a heavy enough pressure to bring out the possibilities of each type of packing with the ability to see the action of the loaded packing and observe the effect of various types of mountings under actual working conditions.

The ram in one cylinder forces the fluid through the flexible tube to the top of a piston in the other cylinder which then forces this piston against a blanket of compressed air. On the return of the ram, the air against the piston forces it to its up position, thus completing the cycle. The amount of air pressure may be controlled at a definite pressure or it may be checked at any pressure and allowed to build up as the hydraulic fluid forces the piston to its down position.

The weight of each finished cylinder is forty pounds, and so far as we know this represents the first step cast resins have taken in this type of research work—especially in transparent castings of this size.

The tin can industry

(*Continued from page 37*) substitutes, will you give the committee a brief history of what has been undertaken, and what can be profitably and wisely undertaken by the Government in that field?

MR. EMLEY (Chief of the Organic and Fibrous Materials Division, National Bureau of Standards). When the Army became interested in finding a substitute for tin, they were able to give us a little bit of money for investigation of that subject. The money was not sufficient to pay the salary of one man, so that we could not get very far, but we did, however, make a survey of the situation. The results ran something like this, that, first of all, we must find a synthetic resin which could be used as a liner for food containers, which would not be soluble in liquids, and not add an odor or flavor to foods. That did not seem to be difficult, although it might require different resins for different foods. Then there was the problem, could they use this resin as a liner for a container in place of tin and still make up the can satisfactorily; that is, the mechanical equipment of seaming the can and putting the cover on might break the resin, so as to expose the iron and give us trouble. That has been solved to a limited extent in the industry, although we did not do anything about it ourselves except to investigate the situation, and the Army put problems up to us which we did not do anything about at all, such as "Suppose that a private throws a case of peas

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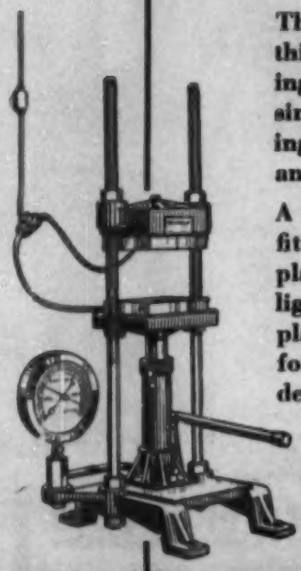

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off of the top of the truck, the can will be dented; will the resin have sufficient elasticity to stretch?"

I believe that the solution of the problem of the finding of a substitute for tin for the lining of food containers is quite feasible. In the field of molded plastics, so much has developed in the last 2 or 3 years, since we investigated the situation, that it looks to me as though they could do almost anything they want to.

MR. C. Do you think you can safely say that if you had the money to conduct the proper type of research you would have some reasonable expectation of accomplishing results?

MR. E. Reasonable expectation, I think, is exactly the term. We do not promise results in research work, but we have a fair chance.

MR. JOHNSON (Congressman from Texas). And you think it worth the expenditure of money, considering the prospects?

MR. E. Yes, sir; I believe it is.

MR. J. How much money do you think would be necessary to make such an investigation?

MR. E. Well, the investigation would take three different phases, as I say. First, there would be the laboratory investigation, of finding the material which can be used, without contaminating the food. Having found such a material, it would be necessary to put it into a cannery and have the cans made with the foods in them. Then, if we can get through that stage, it would be a case of putting some of the canned goods into transit, to see what effect the shipment and storage would have on them. I think that we could get sufficient cooperation from the canners, so that the factory end of it can be worked out, and I am sure that the shipping end can. So I would say $7,500 a year, for 3 years.

MR. J. And that investigation would relate to one phase of the subject, and that is the lining of cans?

MR. E. Solely that.

MR. BUCKMAN (Technical Counsel to the Committee). May I ask, in connection with the work that you have done and in this work that you are contemplating, when you speak of further research, do you contemplate a fair expectation of success in developing a coating for steel which can be applied to the sheet before fabrication of the can, and which will overcome the difficulties of seaming, and so forth, or do you anticipate the use of that in making the can first and then dipping the can in the material? In other words, do you anticipate trying for a complete solution of that problem?

MR. E. I would think that the coating of the sheet before the can is formed would be the logical solution. Otherwise, there would be too many changes in equipment necessary.

MR. B. You believe that there is a fair expectation of success in that?

MR. E. Yes, sir.

MR. C. It occurs to me that $7500 would not scratch the surface on it.

MR. E. We are used to working on very small funds.

MR. B. After you have found the solution to that, and tested it out, would you not still have to solve the problem of commercial production of that substitute, and might not that involve considerable research, and

you would have the problem of raw material and of your synthetic resins. Would you expect to find all of those domestic products, or do some of them have to be imported?

MR. E. No; I think they could all be produced domestically, but it might be necessary to develop manufacturing processes for those materials on a larger scale if those things went across in a big way.

MR. B. You would proceed with your research, of course, not only upon the use of known resins and other materials, but you would also undertake a systematic research of the synthesis of possible new bodies which might be used, would you not?

MR. E. Of course, that had not been included in the estimate that I gave.

MR. B. That is what I am trying to bring out.

MR. E. I was going on the assumption that some of the resins now in existence would be satisfactory.

MR. B. But if you are going into all of those fields of research, it would be of entirely different magnitude?

MR. E. Yes.

MR. B. As to existing known types of resins, has not that field been pretty well combed over in previous attempts to use them, and, if so, why didn't you do it in this very work? Simply because you did not have the money and the facilities?

MR. E. That is all.

MR. B. But in that same type of work which has been done in the industries and by the institutions of learning in their research along those lines, have they pretty well covered the field of existing organic materials that are available in commercial quantities?

MR. E. Of course, the field of existing organic materials is practically infinite. They know the general types of these resins, and what we can do with them, and pretty well how to modify them, how to get other properties which may be needed for a specific purpose.

MR. C. You referred to Bakelite and similar substances. Has any effort been made to determine whether you could contain foodstuffs in cans or containers of that type of material?

MR. E. Without the steel?

MR. C. Yes; without the steel.

MR. E. I do not believe so. I think that the present situation with those materials is that it is entirely too expensive.

MR. EATON (Congressman from New Jersey). So far, have not resins been put in cans that were not tin coated?

MR. E. I cannot say positively about that. There may have been some used without the tin, but I have never seen them.

MR. EATON. So it would not help us if we had the resin without the tin?

MR. E. Not with our present knowledge.

MR. C. You have heard the remarks made previously by the gentlemen from the Bureau of Standards. If you have something to add, I wish you would state it to the committee.

MR. KLINE (Chemist, National Bureau of Standards). My connection with the work was in the development of a substitute for the food container and I wish to point out the importance of this particular problem, inasmuch as approximately half of the tin that is imported is used in the tin-plate industry, and

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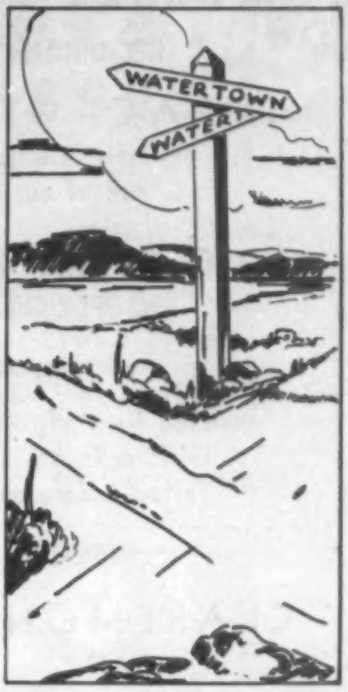

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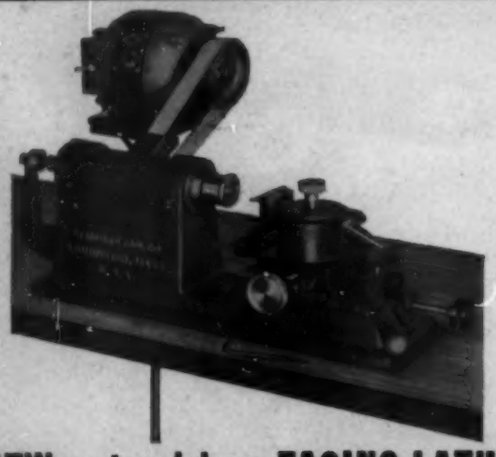

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most all of the tin plate is consumed in canneries.
MR. C. Do you have anything to add about the substitutes for use in food containers?
MR. K. Just that the canning companies have indicated that the solution to the food-container substitute is in the development of an organic coating material for the steel base plate."

The fact that the container industry is aware of the need of research on the applications of plastics to their products is evident in the recent announcement by the Mellon Institute of the establishment of a Food Container fellowship. It is understood that this investigational program will include a study of resinous materials for can linings.

The contemporary patent literature is replete with portents of new packaging vehicles to come. Thus British patent 402,877 (December 14, 1933) describes containers made of or containing cellulose esters or ethers which are rendered resistant to water, acids, alkalies, gases or vapors, and organic solvents by coating with a material comprising a polymerized vinyl hydrocarbon, particularly polymerized styrene or its homologs. French patent 764,479 (May 22, 1934) refers to transparent containers for beverages made by dipping very light silk or rayon into a solution of vinyl or benzylvinyl resins. United States patent 2,030,059 (February 11, 1936) describes a container for food, formed mainly of a cellulose acetate composition or the like and with a reinforcing fibrous section molded integrally into the wall structure.

Methods for the production of transparent containers are reviewed by T. Baumgartel in Kunststoffe, volume 25, pages 283-4, 1935. It does not require the imagination of a Wells or Stevenson to picture the rapid-fire production of plastic bottles by injection molding machines. Plastics entered the packaging field at the top, but it will be many a day before we have struck the bottom of their potential utility in this rapidly growing packaging industry.

Breaker strips ahead

(*Continued from page 46*) a cabinet makes the building of multiple cavity molds impractical in many instances. In molding, resin impregnated paper or board is usually used in order to give the required strength.

Laminating, or the pressing of sheets which are then cut to the proper size, is the common and more practical method of producing strips today. But in pressing the large sheets very high pressures are required, running up to two thousand pounds per square inch. When the impregnated paper or board is laid between polished plates and pressed at such great pressure under heat, it melts and solidifies into one solid homogeneous mass. The finish on the surface is an exact reproduction of the finish on the plate—just as in molding. High pressures and modern presses greatly cut the curing time on these large sheets and lower their cost in proportion.

Cutting the sheets into strips exactly the right size incurs another problem in economical manufacture and the right saw is not only difficult to get but is important to the finished result. The pitch of the tooth, rate of feed and the speed of the saw are all important, as well as the hardness of the steel itself.

The rough sawed sheets next have to have their edges beveled or rounded, as the case may be, and are then cut to length with a mitered end to fit the particular box for which they are designed. After mitering, comes the drilling, buffing the edges, then wiping the polished surface before the strips are packed for shipping.

In many plants this production goes on day after day, week after week, with three eight-hour shifts daily, in order to satisfy the demands of returning prosperity and to safeguard health through refrigeration.

Breaker strips, however, are but one item in the huge output of laminated phenolics. But they represent a type of plastics application which promises an extended and rapid growth in the very near future. It must be remembered that laminated materials are much stronger and more flexible than straight molded parts. Nor is it necessary for them to be laminated only in sheet form. A combination of molding-laminating may open the way at almost any moment for huge moldings never yet undertaken. It is not outside the scope of possibility that refrigerators can be molded in their entirety. The two shells would be molded separately and simply sealed together with a phenolic cement. They would be lighter, better insulated, and more durable than the present cabinets and the savings made possible by the absence of labor and material costs required for finishing would almost compensate for the costs of molds.

Automobile engineers are seriously interested in such possibilities. And since the automotive field has been a leader in the use of molded parts for electrical and ignition work, it is only natural to expect such new developments to emanate from this same progressive field. Today, the interior of the automobile is being considered as a possible place for improvement through the use of molded-laminated materials. These materials can be molded into shapes with comparatively small draw. This makes possible the molding or pressing of panels for the interior of cars which would be clean, modern and luxurious. Their light weight, coupled with their natural warmth and insulative qualities, make them ideal materials for the purpose. Assembly charges considered, their cost would be less, probably, than present interiors. Instrument panels could be molded to match in complete assemblies with a resulting saving of labor costs on the production line. The rise of flat panels for trim is already under consideration as a starting point for the modernization of interiors to bring them into line with the remarkable progress that has been accomplished on exteriors through design.

The use of laminated materials in the building field for such purposes as paneling bathrooms, for partitions in public buildings and hospitals, for window frames and for window sills, is gaining favor not only in homes but in railway coaches and planes as well. Kick-boards, dados and push-plates are some of the other popular uses to which laminated materials have become increasingly available. But there is no reason to stop here. Sink-drain boards have been molded in England, and possibly in this country, too. Why, then, shouldn't bathtubs, wash bowls and other sanitary equipment take advantage of these modern, lighter weight, less breakable materials?

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